# COLORADO RIVER BASIN SALINITY CONTROL ACT AMENDMENTS

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## HEARING

BEFORE THE

SUBCOMMITTEE ON WATER AND POWER

OF THE

COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

SECOND SESSION

ON

## S. 2202

A BILL TO AMEND THE COLORADO RIVER BASIN SALINITY CONTROL ACT TO AUTHORIZE CERTAIN ADDITIONAL MEASURES TO ASSURE ACCOMPLISHMENT OF THE OBJECTIVES OF TITLE II OF SUCH ACT, AND FOR OTHER PURPOSES

JUNE 22, 1982

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# COLORADO RIVER BASIN SALINITY CONTROL ACT AMENDMENTS

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TUESDAY, JUNE 22, 1982

U.S. Senate,
Subcommittee on Water and Power,
Committee on Energy and Natural Resources,
*Washington, D.C.*

The subcommittee met, pursuant to notice, at 9:10 a.m., in room 3110, Dirksen Office Building, Hon. Frank H. Murkowski, presiding.

Present: Senator Murkowski.

Also present: Russell R. Brown, professional staff member and Craig Gannett, counsel for the minority.

## OPENING STATEMENT OF HON. FRANK H. MURKOWSKI, A U.S. SENATOR FROM THE STATE OF ALASKA

Senator Murkowski. Good morning. We will call to order the Subcommittee on Water and Power of the full Committee on Energy and Natural Resources.

I want to welcome you all this morning to the hearing before the Subcommittee on Water and Power. I look forward to the testimony from the witnesses assembled. I notice a rather lengthy list so in hopes that we can finish prior to 12:30, we will limit, or ask you to limit, your testimony to about 5 minutes.

We will take testimony from the administration and public witnesses on Senate bill 2202, legislation introduced by Senator Armstrong who is with us today and will be the first witness called upon, and cosponsored by several other Senators, which would amend title II of the Colorado River Basin Salinity Control Act of 1974.

I don't have to remind any of you here today of the complexity of the issues involving the Colorado River or the relationship of the Colorado to the economic health of our Western States. The problems of the Colorado do not recognize political boundaries, whether State or national, and as such need to be addressed at the Federal level.

The bill before us today reflects the experience that we have had with the Salinity Act of 1974 and I believe is a good effort towards fine tuning the program in response to both that experience and revised projections of future needs.

We have a heavy witness schedule and the subcommittee will do its best to accommodate each of you.

A copy of S. 2202 will be placed in the record at this point.

[The text of S. 2202 follows:]

II

97TH CONGRESS
2D SESSION

# S. 2202

To amend the Colorado River Basin Salinity Control Act to authorize certain additional measures to assure accomplishment of the objectives of title II of such Act, and for other purposes.

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## IN THE SENATE OF THE UNITED STATES

MARCH 15 (legislative day, FEBRUARY 22), 1982

Mr. ARMSTRONG (for himself, Mr. HAYAKAWA, Mr. DECONCINI, Mr. LAXALT, Mr. CANNON, Mr. GOLDWATER, Mr. WALLOP, Mr. HATFIELD, Mr. CRANSTON, Mr. HART, and Mr. SIMPSON) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

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# A BILL

To amend the Colorado River Basin Salinity Control Act to authorize certain additional measures to assure accomplishment of the objectives of title II of such Act, and for other purposes.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the Colorado River Basin Salinity Control Act (43 U.S.C. 1571 et seq.) is amended—

(1) at the end of section 201(a) (43 U.S.C. 1591(a)), by adding the following new sentence: "Actions under this title shall not be governed by the prin-

ciples, standards, and procedures for planning water and related land resources promulgated pursuant to the Water Resources Planning Act (42 U.S.C. 1962 et seq.).";

(2) at the end of section 201(b) (15 U.S.C. 1591(b)), by adding the following new sentence: "In determining the relative priority of implementing additional units or new self-contained portions of units authorized by section 202, the Secretary shall give preference to those additional units or new self-contained portions of units which reduce salinity of the Colorado River at the least cost per unit of salinity reduction.";

(3) before the beginning of the first sentence of section 202 (43 U.S.C. 1592), by inserting "(a)";

(4) in the second sentence of paragraph (2) of section 202(a) (43 U.S.C. 1592(a)(2)), by inserting "replacing canals and laterals with pipe, implementing other measures to reduce salt contributions from the Grand Valley to the Colorado River," after "canals and laterals,";

(5) in paragraph (2) of section 202(a) (43 U.S.C. 1592(a)(2)), by striking out the fourth, fifth, and sixth sentences;

(6) in section 202(a) (43 U.S.C. 1592(a)), by adding at the end thereof the following new paragraphs:

"(5) Stage I of the Lower Gunnison Basin unit, Colorado, consisting of measures and all necessary, appurtenant, and associated works to reduce seepage from canals and laterals in the Uncompahgre Valley, essentially as described in the status report dated July 1981.

"(6) The McElmo Creek unit, Colorado, consisting of measures and all necessary, appurtenant, and associated works to reduce seepage from canals and laterals in the Montezuma Valley, essentially as described in the status report dated July 1981.

"(7) Stage I of the Uinta Basin unit, Utah, consisting of measures and all necessary, appurtenant, and associated works to reduce seepage from canals and laterals in the Uinta Basin, essentially as described in the status report dated July 1981.

"(8) The Palo Verde Irrigation District unit, California, consisting of measures and all necessary, appurtenant, and associated works to reduce seepage from canals and laterals in the Palo Verde Valley, essentially as described in the special report dated July 1981.

"(9) Saline water use and disposal opportunities unit, consisting of measures and all necessary, appurtenant, and associated works to demonstrate saline water use technology and to beneficially use and dispose of saline and brackish waters of the Colorado River Basin in joint ventures with current and future industrial water users, using the concepts generally described in the Secretary's special report of September 1981 entitled 'Saline Water Use and Disposal Opportunities'.

"(10) Sinbad Valley unit, Colorado, including all necessary and appurtenant works, to minimize to the extent practicable salt contributions to the Colorado River from lands administered by the Bureau of Land Management in Sinbad Valley, essentially as described in the 1978 through 1979 Bureau of Land Management salinity status report dated February 1980.";

(7) at the end of section 202(a) (43 U.S.C. 1592(a)), as amended by paragraph (6), by adding the following new subsection:

"(b) In implementing the units authorized to be constructed pursuant to subsection (a), the Secretary shall carry out the following directions:

"(1) Prior to initiating construction of works pursuant to this subsection and subsection (a), and where the Secretary determines that implementing a unit or portion thereof in joint venture with non-Federal entities is in the best interest of the United States, the

Secretary shall enter into contracts or agreements with legally qualified participating entities, as defined in the Reclamation Project Act of 1939 (43 U.S.C. 485 et seq.), and with industrial water users, as provided for in subsection (a)(9). Such contracts or agreements shall define the responsibilities of the various participants for financing, construction, operation, and maintenance of facilities constructed under the authority of this subsection and subsection (a) to the end that the maximum reduction of salinity of the Colorado River will be achieved. Such cost as the United States shall incur pursuant to such contracts or agreements shall represent an equitable apportionment of the total cost of the facilities among the various participants based upon benefits received. Such contracts or agreements are to be effective for any fiscal year only to such extent or in such amounts as are provided in appropriation Acts.

"(2) The Secretary may not assume, under the authority of this title, long-term operation and maintenance obligations for facilities constructed or measures undertaken to replace incidental wildlife values and canal and lateral systems constructed pursuant to this title, except that the Secretary is authorized to provide continuing technical assistance to assure the effective operation and maintenance of such measures and systems.

"(3) In areas where canal and lateral improvement salinity control measures are authorized pursuant to subsection (a), the Secretary is also authorized under this title to improve additional portions of interconnected canal and lateral systems where the cost of such additional facilities will be repaid in a manner satisfactory to the Secretary. In determining that such additional measures should be undertaken, the Secretary shall utilize the procedures that govern justification of projects undertaken pursuant to the Small Reclamation Projects Act of 1956 (43 U.S.C. 422a et seq.). In establishing repayment responsibilities, the Secretary shall give recognition to any incidental salinity benefit that would accrue from such measures, related costs to be assigned to salinity control purposes and allocated and repaid as provided in section 205 of this title, except that in the case of facilities serving Indian lands, any repayment of costs pursuant to this title shall be subject to the Leavitt Act (25 U.S.C. 386a).

"(4) If the Advisory Council established pursuant to section 204(a) of this title requests, and the Governor of the State where the measures are to be implemented concurs, any salinity control unit or discrete portion thereof authorized by section 202 of this title may include measures to replace incidental wildlife values foregone as a result of constructing that unit or discrete portion thereof, except that—

"(A) such measures shall not significantly diminish the salinity improvement to be achieved by the unit;

"(B) use of water for such measures shall be in accordance with State water law;

"(C) to the extent practicable, the measures undertaken shall minimize the use of water; and

"(D) the cost of such measures shall be only a minor part of the total cost of each salinity control unit or separable portion thereof.

"(5) As reports are completed describing final implementation plans for units 5 through 10 or portions of these units authorized by section 202(a), prior to expenditure of funds for related construction activities, the Secretary shall submit such reports to the appropriate committees of the Congress and to the Governors of the Colorado River Basin States in the manner provided for revision of projects pursuant to section 208(a) of this title.";

(8) at the end of section 202(b) (43 U.S.C. 1592(b)), as added by paragraph (7), by adding the following new subsection:

"(c)(1) The Secretary of Agriculture is authorized and directed to establish as described in this subsection a voluntary cooperative program with private landowners to improve on-farm water management and reduce watershed erosion on non-Federal lands and on lands under the control of the Department of Agriculture for the purpose of assisting in meeting the objectives of this title.

"(2) In carrying out such program, the Secretary of Agriculture shall—

"(A) identify salt-source areas and determine the salt load resulting from irrigation and watershed management practices;

"(B) develop, in consultation with the public and affected governmental interests, plans for implementing measures that will reduce the salt load of the Colorado River by improving on-farm irrigation water management including improvement of related laterals and by improving watershed erosion management practices, such measures to include replacement of incidental wildlife values in the manner described in subsection (b)(4);

"(C) provide technical and cost-sharing assistance for the voluntary implementation of plans through contracts and agreements with individuals or groups of owners and operators of farms, ranches, and other lands as well as with local governmental and nongovernmental entities such as irrigation districts and canal companies, except that a portion of the costs of implementing such plans shall be shared by the participants on the basis of benefits received and other appropriate factors, as determined by the Secretary of Agriculture, and except that such contracts and agreements shall provide for continuing operation and maintenance of measures installed under this subsection;

"(D) provide continuing technical assistance for irrigation water management as well as monitoring and evaluation of changes in salt contributions to the Colorado River to determine program effectiveness; and

"(E) carry out related research, demonstration, and education activities.

"(3) The measures to be implemented in any particular salt source area shall be described in reports issued by the Secretary of Agriculture. Copies of the reports are to be submitted to—

"(A) committees of the Congress having jurisdiction over programs of the Department of Agriculture;

"(B) members of the Advisory Council established by section 204(a) of this title; and

"(C) the Governor of any State where measures are to be implemented.

No funds for implementation of proposed measures undertaken pursuant to this subsection may be expended until the expiration of sixty days after submission of the report of the Secretary of Agriculture, and not then if such report is disapproved by the receiving committees of the Congress, the involved Governor, or the Advisory Council. Measures included in any report shall be programed for completion within ten years unless a longer period is concurred in by the Advisory Council.

"(4) The Secretary of Agriculture shall use existing agencies, as well as the Commodity Credit Corporation, to carry out the provisions of this title. There are authorized to be appropriated and expended, based on April 1981 prices, plus or minus such amounts as may be justified by reason of ordinary fluctuations in construction cost involved therein, to carry out the provisions of this subsection for the fiscal year 1983, $12,700,000; for the fiscal year 1984, $21,500,000; for the fiscal year 1985, $28,600,000; for the fiscal year 1986, $31,700,000; for the fiscal year 1987, $35,000,000; for the fiscal year 1988, $35,000,000; for the fiscal year 1989, $29,800,000; and such additional sums as may be necessary except that such sums as have been or shall be appropriated shall remain available until expended.

"(5) The Secretary of Agriculture may not assume continuing operation and maintenance obligations for permanent salinity control measures constructed on non-Federal lands pursuant to this title.";

(9) in section 203(b) (43 U.S.C. 1593(b))—

(A) by striking out the period at the end of paragraph (2) and inserting in lieu thereof "; and"; and

(B) by adding at the end thereof the following new paragraph:

"(3) to develop a comprehensive program for minimizing salt contributions to the Colorado River from lands administered by the Bureau of Land Management and submit a report which describes the program and recommended implementation actions to the Congress and to the members of the Advisory Council established by section 204(a) of this title by July 1, 1984.";

(10) in section 205(a) (43 U.S.C. 1595(a)), by inserting "(herein defined to exclude costs borne by non-Federal entities pursuant to paragraphs (1), (2), and (3) of section 202(b) and pursuant to section 202(c)(1)(C))

of the on-farm programs, measures and" after "total costs";

(11) in section 205(a)(3) (43 U.S.C. 1595(a)(3)), by inserting "or the estimated life of the facility, whichever is less," after "fifty-year period";

(12) in section 208, by striking the first sentence;

(13) in the second sentence of paragraph (b) of section 208 (43 U.S.C. 1598(b)), by striking out "section 202" and inserting in lieu thereof "sections 202(a) and 202(b)"; and

(14) after the second sentence of subsection (b) of section 208 (43 U.S.C. 1598(b)), by inserting the following new sentence: "The funds authorized to be appropriated by this section may be used for construction of any or all of the works or portions thereof and for other purposes authorized in subsections (a) and (b) of section 202 of this title.".

SEC. 2. The amendments made by this Act shall take effect on October 1, 1982.

Senator **Murkowski**. The hearing record will remain open an additional 10 days so that any of you or other interested parties may submit written materials.

I am sorry to advise you that Senator Goldwater will not be able to be with us today, but we have his statement and statements of Senators Garn and Hatch which will be submitted for the record.

[The prepared statements of Senators Goldwater, Garn, and Hatch follow:]

Statement by
The Honorable Barry M. Goldwater
before the
Subcommittee on Water and Power
on
S. 2202, a Bill to amend the
Colorado River Basin Salinity Control Act
June 22, 1982

Mr. Chairman and Members of the Subcommittee, I appreciate this opportunity to offer a statement in support of S. 2202, a bill to amend the Colorado River Basin Salinity Control Act to authorize certain additional measures to assure accomplishment of the objective of Title II of such Act, and for other purposes.

I want to thank you, Mr. Chairman, for scheduling this hearing on legislation that is so urgently needed to continue a water pollution control program in the seven States that depend on the Colorado River as a source of water supply.

To the credit of the seven-State Colorado River Basin Salinity Control Forum, composed of representatives from each State, this legislation, drawn up in consultation with responsible Federal officials, is now before the Senate for its consideration. I'm pleased to be a co-sponsor of S. 2202, along with many of my colleagues in seven States, and I respectively urge the Subcommittee to give it favorable attention.

According to the best estimates, the monetary damages to Arizona and the other basin States from an increase in salinity of the Colorado River could grow to $237 million annually by the year 2000 without the implementation of control measures. Central Arizona expects to be utilizing Colorado River water by the mid-1980's. As the years progress and the availibility of a water supply is diminished by Upper Basin diversions, a greater proportion of Colorado River water will be used for municipal and industrial purposes in my State. It is clear that Arizona is faced with the prospects of increased water treatment costs, health problems, and other damages difficult to qualify, in the absence of a comprehensive salinity control program.

The legislation before the Committee is a product of many years experience by State and Federal officials in ways to reduce the salt load in the Colorado River and protect this vital resource.

The comprehensive program that has evolved gives great promise that the salinity levels in the lower mainstream of the Colorado River can be maintained at or below the 1972 historical level; can protect the integrity of the United States agreement on water delivered to Mexico, and allow the Basin States to continue to develop their apportioned water.

Over the years, it has become apparent that improved on-farm irrigation water management can play a major role and be more cost-effective in reducing salinity. S. 2202 recognizes this promising development and provides the Secretary of Agriculture the authorization to initiate plans specially tailored to the objectives of the salinity control program. We have been acutely aware of the difficulties in working with the Agricultural programs currently being followed.

The repayment criteria will be the same as is now required of Department of the Interior activities. In addition, of course, farmers cooperating in the on-farm programs would contribute upfront monies to help pay a portion of the costs.

S. 2202 also promises the development of a program for salinity control on lands administered by the Bureau of Land Manqgement. I'd like to call attention to members of the Committee that almost half of the sources of salinity in the Colorado River, 47 percent to be exact, can be attributed to natural sources. It is important that the Agency has a part to play, and I am pleased to note one of the six units recommended for authorization in the legislation is situated on public land.

I should also like to point out to the Subcommittee that S. 2202 also provides joint ventures with industrial users so that brackish and saline waters can be beneficially used for industrial purposes. The possibility of saline water use and disposal opportunities is recognized in a special report prepared by the Bureau of Reclamation dated September 1981.

Finally, Mr. Chairman and Members of the Subcommittee, I believe it is important that provision is made in this legislation to replace incidental wildlife values foregone as a result of the program. Also, it has been made quite evident in the management of this program over the years that the Secretary of the Interior needs the latitude and flexibility to apply authorized appropriations to those units which best meet the salinity control program's goals and objectives.

Mr. Chairman, the Colorado River Basin Salinity Control Forum has carefully crafted S. 2202 to allow for the continuation of an important unique partnership between the Federal Government and the Colorado River Basin States.

Again, I urge the Subcommittee's favorable report of the legislation. Thank you for the opportunity to present this testimony.

# # # #

# Statement by Senator Jake Garn on S. 2202

Chairman Murkowski and members of the Water and Power Subcommittee, I appreciate the opportunity to express my full support for the legislation embodied in S. 2202.

This legislation represents a comprehensive approach to cleaning up one of America's most significant river systems and provides a mechanism to more efficiently utilize scarce western water resources. Significantly, the legislation will provide the framework for a combined effort by the U.S. Department of Interior and the U.S. Department of Agriculture for a truly cost-effective approach to salinity control.

Since, funds have already been authorized under the Colorado River Salinity Control Act of 1974, enactment of S. 2202 will require no new budgetary authority for the Department of Interior. Yet passage of S. 2202 will broaden the scope of salinity control within the Department of Interior by allowing the Bureau of Land Management to accompany the Bureau of Reclamation in a major desalinization effort.

I wish to emphasize however, an aspect of the legislation which is, in my opinion, the cornerstone of the salinity control effort; that is, the voluntary, on-farm, cost-share program to be operated by the Department of Agriculture.

An on-farm emphasis to salinity reduction makes sense for a number of reasons:

(1) It will result in a much more efficient use of scarce western water supplies through introduction of modern irrigation practices.

(2) By discouraging excessive irrigation, the net effect of the program will be to significantly reduce soil leaching, and result in less saline water transport to the river.

(3) The program will inevitably improve farm productivity in the arid west.

This type of cost-sharing, modeled after the existing Agriculture Conservation Program (ACP), provides a logical incentive to encourage farmers to use efficient irrigation practices while reducing salt contamination of the Colorado River and its tributaries.

In Utah, the existing salinity cost-share program in the Uintah basin has proved to be enormously successful. In 1980 and 1981, 111 long term and 68 annual agreements have been approved for cost-sharing. During fiscal year 1982, local authorities report an additional 55 long term, and 30 annual agreements will likely be approved to reduce salt loading in the Colorado River.

I believe this program is one of the few where a truly cooperative federal-private partnership is possible to achieve a common goal.

While there are undoubtedly some who may object to a new program of any type for the Department of Agriculture,

S. 2202 provides a real opportunity to produce significant, tangible improvements in water quality while upgrading the efficiency of agriculture.

In my opinion, the on-farm, cost-share approach provided for in this legislation represents a cost-effective expenditure of tax dollars and is consistent with the Reagan Administrations emphasis of completing western water reclamation projects and its overall approach to natural resource policy.

Colorado River Salinity Control Act of 1974

Senator Orrin G. Hatch
June 22, 1982

I would like to take this opportunity to support S. 2202, a bill introduced by Senator Armstrong of Colorado and cosponsored by myself, which would authorize additional salinity control measures to be taken in order to fulfill the objectives of the Colorado River Salinity Control Act of 1974.

As you know, the Colorado River is the lifeblood of the West. More than 15 million residents of the states of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming benefit from the River's existence and countless others will become dependent on the river as growth continues to boom on the West coast.

Water from the Colorado supports the agricultural, industrial and municipal needs of many areas in the region, as well as providing sustenance to the many forms of wildlife along its banks.

However, a major problem is arising as a result of increasing salinity concentrations along the river's path, causing considerable economic damage to agricultural, municipal, and industrial water users, as well as environmental damage to important fish and wildlife habitats. Increased salinity effects municipal water supplies causing additional soap and detergent consumption, corrosion and scaling of metal water pipes, water heaters, accelerated fabric wear, added water softening costs, and in extreme cases, abandonment of supply.

Approximately half of the present salinity concentration in the Colorado river can be attributed to natural resources. The remaining half have been caused by man. Unfortunately, the construction of dams, which are an absolute necessity for survival in the arid West, has contributed to the increase of salinity levels in areas surrounding their construction.

The results of high salinity have had and will continue to have a negative economic impact on the area surrounding the river's path. For irrigators, the higher concentrations cause decreased crop yield, altered crop patterns, increased leaching and drainage requirements, and increased management costs.

It is estimated that the high salt load which enters Lake Meade, for example, in the Lower Colorado River Basin adversely effects more than ten million people and one million acres of irrigated farmland in the United States.

In 1981, the cost of damages to residents of the area exceeded $96 million dollars and unless something is done to alleviate the increased salinity in the area, the damages could rise to approximately $237 million by the year 2000.

In 1974, Congress passed legislation dealing with this issue. Although significant benefits have been derived form the implementation of the Act, the salinity problem, as I have previously mentioned is continuing and will continue to be aggravated as the basin develops.

S. 2202 will mitigate some of the salinity problems I have described, by:

1. Authorizing six new salinity units (one of which will be located Uintah Basin in Utah) which will be constructed within the fund ceiling established in the 1974 Act.
2. Improving a large network of canal and lateral systems.
3. Providing for the replacement of wildlife and environmental values which might be impaired.
4. Providing for implementation of a more streamlined and effective on-farm control program through the Department of Agriculture.

The program outlined in this bill comprehensively addresses the problem of salinity through the use of on- and off-stream management techniques.

The on-farm program will aid farmers in irrigating in the most efficient way possible, avoiding overuse of water and water evaporation, thereby lessening the amount of salt which is leached in the soil. This program has been particularly successful in the reclamation of land which has been lost to salinity, as todays witness from the Uintah Basin will attest.

The construction of water canals and installation of salinity units will allow water to run its course without coming into contact with salt laden soil.

In addition, the enactment of this legislation will ensure the balance of the environmental habitat is maintained, and should benefit wildlife adversely affected by high salinity levels.

Mr. Chairman, as a resident of Utah, one of the seven states which is served by this important river, and as one who is sensitive to the water problems of the West, I urge that serious consideration be given by this committee to the adoption of S. 2202. The enactment of this legislation will help to maintain and preserve the Colorado River benefitting not only those residents of my home state of Utah and the six states surrounding her, but the entire nation as well.

Senator MURKOWSKI. On my right is Mr. Russ Brown, who is with the professional staff on the Subcommittee on Water and Power.

Our first witness this morning is my colleague, the able Senator Armstrong, U.S. Senator from Colorado; and we strongly welcome you to the chair and ask that you proceed with your testimony concerning your bill.

## STATEMENT OF HON. WILLIAM L. ARMSTRONG, A U.S. SENATOR FROM THE STATE OF COLORADO

Senator ARMSTRONG. Thank you very much. My friends and I from Colorado and the others from more distant States are extremely grateful to you for scheduling this hearing and for giving us the opportunity to appear.

For my own part, I am going to be quite brief, because on the schedule of witnesses this morning you have some witnesses who are in a position to provide truly expert testimony. A perspective of practical day to day association with the problems of salinity in the Colorado River. I know that you are eager to hear from them and the subcommittee will benefit enormously from their testimony.

I would like to take a few minutes, however, to put in perspective the legislation S. 2202, which I have introduced along with 12 of our colleagues, the Colorado River Basin Salinity Control Amendments Act.

Mr. Chairman, the Colorado River is being slowly but surely poisoned by salt. At the river's headwaters high in Colorado's Rocky Mountains, the water is so pure that there are fewer than 50 parts of salt per million parts of water. But, near the point where the river enters Mexico hundreds of miles downstream, that number leaps to over 800 parts per million, an increase of more than 1,600 percent.

Looked at in terms of weight, the Colorado River carries a staggering 10 million tons of dissolved salt annually as it pursues its course. About half of this amount comes from natural sources. Another 37 percent comes from irrigation agriculture, which extends the river's contact with saline western farmland. The remaining amount of salt, about 16 percent, comes from such things as evaporation from reservoirs, along with municipal and industrial uses.

So far, Mr. Chairman, the situation which I have outlined might be of interest only to the geologists and water engineers among us, but the gravity of the problem is clarified when you consider the importance of this river in the West.

The Colorado, along with its extensive system of tributaries, drains fully a quarter of the land mass of the 48 contiguous States and is the lifeblood for 17 million Americans from Denver to San Diego. It is no exaggeration to say that the Colorado River made the difference between desert and civilization in the American Southwest.

Thanks to the 80-year miracle of the Reclamation Act of 1902, whose furtherance is one of the greatest accomplishments of this committee, the Colorado River has made the western deserts bloom with agricultural and economic vitality. One and a half million acres of prime farmland have been reclaimed and irrigated by it, and today produce bumper crops of food, forage, and fiber that are worth many millions of dollars.

In addition, the river supplies municipal and industrial water systems along its 1,400-mile length, and is largely responsible for the commerce and communities of the seven western States it serves. Its dams generate a king's ransom of hydroelectricity every year, while its channels, reservoirs, and rapids provide a wealth of recreational opportunities.

The Colorado River is also one of America's most spectacular rivers and it supports an incredible diversity of plants, fish, and wildlife in a fragile ecosystem.

In short many, many millions of people so much depend on this river that it continues to shape the West in as dramatic a way as it shaped the Grand Canyon.

And yet, Mr. Chairman, there remain these 10 million tons of dissolved salts carried by this river every year. These salts are channeled or piped into every field, factory, and home that uses Colorado River water.

In my prepared statement I discuss at some length the consequences of the saline content, but to sum it up an increase of just one part per million causes a verifiable loss of $472,000 per year. By the same token, however, if we can diminish the saline content we will reduce that damage by one-half million dollars every year.

My statement also discusses the foreign policy aspects of this and there is no question that the increasing salinity of the river imposes a source of irritation to our neighbors to the south in Mexico. We are under an obligation to improve the performance of the river, and I also discuss that at some length in my remarks.

Mr. Chairman, the legislation which my colleagues and I have introduced has four important objectives:

One, authorization of six new salinity units, to be constructed within the funding ceiling established in the 1974 act. One of these units is a salinity control project that involves, for the first time, Bureau of Land Management land; another is a broadly defined project that gives the Department of the Interior flexible authority to demonstrate new technologies for disposing beneficially of this waste saline water.

Improvement of a large network of canal and lateral systems, with everything but the salinity benefits being reimbursed to the Federal Government by the water users who benefit.

Three, replacement of incidental wildlife or other environmental values that may be impaired due to construction of salinity control projects.

Four, implementation of a more streamlined and effective onfarm control program through the Department of Agriculture. This program will be entirely voluntary in nature and pursued cooperatively with private landowners; it is designed to improve water management and conservation, while reducing watershed erosion.

The witnesses who are going to testify this morning are truly experts who will testify on every aspect of this legislation from firsthand experience. Among those who will be testifying here today are four of our State's most distinguished residents. Mr. John Frezieres, president of the Mesa Soil Conservation District and irrigation farmer. He has been actively involved. I have no doubt that his comments will be extraordinarily useful.

Also testifying on behalf of our State is Mr. J. William McDonald, who is director of the Colorado Water Conservation Board and enjoys a high reputation as one who is knowledgeable in this complex area of specialization.

Mr. Ira McKeever is president of the western mining operation, W. R. Grace & Co. He will explain to the committee a new technology which his company is developing to utilize saline water in an ingenuous manner.

And, finally, Dr. Clayton Smith is the division manager of the Solar Energy Research Institute. He will testify about some extraordinary interesting work which is being done involving saline water which could curtail salinity.

Mr. Chairman, if I may insert a detailed presentation which my staff and I have prepared for the record of this proceedings, we will be grateful and we are extremely appreciative to you and the members of the committee who are interested in this important legislation.

Senator MURKOWSKI. Thank you, Senator. The record will note the submission of Senator Armstrong's presentation. Thank you for your testimony this morning and for your comments on the expertise of the witnesses we are about to call.

[The prepared statement of Senator Armstrong follows:]

# STATEMENT

BY

WILLIAM L. ARMSTRONG

BEFORE THE

WATER AND POWER SUBCOMMITTEE

OF THE

ENERGY AND NATURAL RESOURCES COMMITTEE

June 22, 1982

MR. CHAIRMAN, I would like to begin by thanking you and the Committee for scheduling this hearing and for allowing a prompt and thorough consideration of S. 2202 -- the Colorado River Basin Salinity Control Amendments Act.

The problem we are here to discuss today is one that is complicated and largely unseen: most people are generally unaware that the problem I am about to outline even exists. The plain fact of the matter is that the Colorado River is being slowly but surely poisoned by one of the earth's commonest elements -- salt. At the river's headwaters high in Colorado's Rocky Mountains, the water is so pure that there are fewer than fifty parts of salt per million parts of water (PPM). But, near the point where the river enters Mexico hundreds of miles downstream, that number leaps to over 800 PPM -- an increase of more than 1,600 percent.

Looked at in terms of weight, the Colorado River carries a staggering 10 million tons of dissolved salt annually as it pursues its course. About half of this amount comes from natural sources: direct contact with very saline western soils and salty springs, geysers and aquifers for example. Another 37% comes from irrigation agriculture, which extends the river's contact with saline western farmland. The remaining amount of salt, about 16%, comes from such things as evaporation from reservoirs, along with municipal and industrial uses.

So far, Mr. Chairman, the situation which I have outlined might be of interest only to the geologists and water engineers among us, but the gravity of the problem is clarified when you consider the importance of this river in the West. The Colorado, along with its extensive system of tributaries, drains fully a quarter of the land mass of the 48 contiguous states and is the lifeblood for 17 million Americans from Denver to San Diego. It is no exaggeration to say that the Colorado River made the difference between desert and civilization in the American southwest. Thanks to the 80-year miracle of the Reclamation Act of 1902, whose furtherance is one of the greatest accomplishments of this Committee, the Colorado River has made the western deserts bloom with agricultural and economic vitality. One and a half million acres of prime farmland have been reclaimed and irrigated by it, and today produce bumper crops of food, forage and fiber that are worth many millions of dollars.

The river supplies municipal and industrial water systems along its 1,400-mile length, and is largely responsible for the commerce and communities of the seven western states it serves. Its dams generate a king's ransom of hydroelectricity every year, while its channels, reservoirs and rapids provide a wealth of recreational opportunities.

The Colorado River is also one of America's most spectacular rivers and it supports an incredible diversity of plants, fish and wildlife in a fragile riparian ecosystem. So many and so much depend on this river that it continues to shape the West in as dramatic a way as it shaped the Grand Canyon.

And yet, Mr. Chairman, there remain those 10 million tons of dissolved salts carried by this river every year. These salts are channeled or piped into every field, factory and home that uses Colorado River water. The damage toll is enormous -- the Bureau of Reclamation has estimated that the annual price tag for this damage is around $100 million and will mount to $237 million per year (in constant 1981 dollars) by the end of this century unless tough control measures are implemented now. The Bureau further estimates that 70% of this damage is borne by the municipal and industrial sectors (through corrosion of water systems and the increased cost of treating this extremely hard, saline water), while the remaining 30% is borne by the agricultural sector in the form of crop damage, ruined farmland and reduced yields.

It is important to note that these are estimates of immediately quantifiable economic damage only, and do not include the significant environmental losses, damage to valuable fish and wildlife habitats or the serious health problems that could result from the fact that salinity levels are already running at around 823 PPM -- well above the 500 PPM maximum recommended by the Secondary Drinking Water Standards of the Environmental Protection Agency.

In fact, an increase of just one part per million (as measured at Imperial Dam) causes a verifiable economic loss of $472,000 per year. By the same token, however, we can diminish that damage by half-a-million dollars every year (in constant 1981 dollars) for each PPM of salt we keep out of the Colorado River system. Unless we act decisively today, the salinity level in the river is expected to rise from the current level of 823 PPM to a wholly unacceptable level of 1,200 PPM by the turn of the century.

Additionally, this issue has a very important foreign policy aspect. The salinity of the Colorado River is a source of continuing irritation to Mexico, our important neighbor and ally, because they receive from the United States the saltiest part of one of the most saline rivers in the world. In August of 1973, the United States signed a minute with Mexico stipulating that our neighbor's entitlement water (1.36 million acre-feet each year) would have a salinity of no more than 115 PPM above the level at Imperial Dam. This is an absolute obligation of international law and we have already reached this ceiling. Each additional impoundment structure on the Colorado River and every increase in consumptive use will add to salinity -- thus further degrading the complex river ecosystem and moving us nearer to the salinity ceiling agreed with Mexico.

Finally, the seven Basin States agreed with the EPA in 1972 that the Clean Water Act non-degradation standards for Colorado River water would be 879 PPM. At 823 PPM, we are already very near that ceiling too -- and well above the 500 level set by the Drinking Water Standards. The Bureau of Reclamation estimates that, under current development plans, the 879 non-degradation standard will be breached in 1992. The Bureau further estimates that it will take ten years for the planning and construction of a salinity control system, and for its effect to be felt throughout the Basin. That is why, Mr. Chairman, a ten-year fuse has already been lit. Congress must act, and act this year, because failure to do so could put an abrupt halt to further growth and development in the seven Colorado River states.

In 1974, Congress recognized the urgency of this problem by passing the Colorado River Basin Salinity Control Act. That Act provided for the construction, operation and maintenance of salinity control units at several points along the length of the river. Now it is time to take another step in this critical effort of cleaning up the Colorado River. The bill I have introduced has four important objectives:

1. Authorization of six new salinity units, to be constructed within the funding ceiling established in the 1974 Act. One of these units is a salinity control project that involves, for the first time, Bureau of Land Management land; another is a broadly defined project that gives the Department of Interior flexible authority to demonstrate new technologies for disposing beneficially of this waste saline water.
2. Improvement of a large network of canal and lateral systems, with everything but the salinity benefits being reimbursed to the federal government by the water users who benefit.
3. Replacement of incidental wildlife or other environmental values that may be impaired due to construction of salinity control projects.
4. Implementation of a more streamlined and effective on-farm control program through the Department of Agriculture. This program will be entirely voluntary in nature and pursued cooperatively with private landowners; it is designed to improve water management and conservation, while reducing watershed erosion.

Mr. Chairman, the points that I have discussed this morning will be elaborated on and further explained by the many qualified and experienced witnesses who have come today to testify on this bill. I know I speak on behalf of the twelve Senators who have cosponsored this measure when I thank the Committee for contributing to the progress in this critical area. I commend this legislation to you and urge its consideration and approval at the earliest available opportunity.

Senator MURKOWSKI. We will have the witnesses come before the table as a group. I think that will expedite the hearing a little bit. I am going to call a number of witnesses together.

I believe there are five: Mr. T. Frank Crigler, Director of the Office of Mexican Affairs, Department of State. Good morning. You may be seated.

Mr. Joseph F. Friedkin, U.S. Commissioner, International Boundary and Water Commission, United States and Mexico, El Paso, Tex.

Good morning, Mr. Friedkin. The Honorable Robert Broadbent, Commissioner of Bureau of Reclamation, Department of the Interior.

Good morning, Mr. Broadbent. Mr. Peter C. Myers, Chief, Soil Conservation Service, Department of Agriculture, Washington, D.C.

Mr. Myers, good morning. And last, Frederic Eidsness. Is Mr. Eidsness here?

A VOICE. Senator, he shall be here any minute.

Senator MURKOWSKI. We will save a spot for him. When he comes in, if one of you who recognizes him will direct him to the head table, I would appreciate it.

And that pretty well, I believe, makes up the Government witnesses. I think we will proceed as the witnesses are listed.

And unless there is any objection, hearing none, why we will assume that the first volunteer is Mr. T. Frank Crigler, Director of the Office of Mexican Affairs, Department of State. Mr. Crigler, is the pronunciation correct?

Mr. CRIGLER. Yes, sir.

## STATEMENT OF T. FRANK CRIGLER, DIRECTOR, OFFICE OF MEXICAN AFFAIRS, DEPARTMENT OF STATE

Mr. CRIGLER. I am grateful for this opportunity to appear before this committee with Commissioner Friedkin on my right, to express the Department of State's views on Senate bill S. 2202. In particular, I will comment on the relationship of foreign policy to this bill and on the current state of our relations with Mexico.

This administration places the greatest value on developing close and friendly relations with our nearest neighbors. High level contacts between leaders of Mexico and the United States have been intense. Presidents Lopez-Portillo and Reagan met a total of four times in 1981, virtually unprecedented in the history of our relationship.

As a result of this intensive attention, our relationship with Mexico is good. Trade is at an all-time high. Mexico has jumped from our fifth to our third largest trading partner and bilateral trade in 1982 should reach about $35 billion. Mexico sells us 50 percent of all the oil it exports and is selling us 300 million cubic feet per day of natural gas, and it has expressed interest in increased sales.

While we have had differences on some issues, such as precisely how best to obtain peace in Central America, we have maintained an active and useful dialogue which has created new opportunities for cooperation.

Presidents Reagan and Lopez-Portillo 1 year ago established an action-oriented Binational Commission as well as a Joint Trade Commission to guide and stimulate the more specialized work of a wide range of ongoing cooperative arrangements. One of these, the International Boundary and Water Commission, has been cited by Mexican Foreign Minister Castaneda as a model for other countries.

United States-Mexican bilateral issues are played out most intensely and visibly along our nearly 2,000-mile-long border. One of the first actions taken by Secretaries Haig and Castaneda in the November 1981 meeting of the Binational Commission was to establish a temporary Border Relations Action Group. This group met twice, in February and March 1982, and developed a series of recommendations on how to resolve or more efficiently address a number of border issues. These include questions involving international bridges and border crossings, air pollution, border sanitation and health, juvenile offenders, transboundary spills of hazardous substances and shipments of hazardous wastes, and cooperation along the border in cases of natural disasters. Steps are now being taken by the two governments to implement several of these recommendations.

As significant as these border issues are, they pale in comparison with the past bilateral problem of the salinity of the Colorado River as it flows into Mexico. I agree with Commissioner Friedkin's statement in his 1979 testimony in an appropriation hearing on title I of the Colorado River Basin Salinity Control Act, that—and I quote—"The salinity issue with Mexico was the most serious issue to have beset our relations with that country in more than three decades."

Mr. Chairman, in order to assure that the salinity isssue with Mexico remains under control, the Department of State favors actions to improve the quality of the Colorado River, whether below the Imperial Dam as specifically related to our commitments to Mexico or above that dam.

Neither the Department of State nor the U.S. Section of the International Boundary and Water Commission is qualified or empowered to comment on the detailed matters of domestic concern contained in this bill. On those matters we defer to the Departments of Interior and Agriculture, but we agree with the intent of this bill.

Ambassador Joseph F. Friedkin. U.S. Commissioner of the International Boundary and Water Commission, has long experience with the Colorado River salinity issue as it relates to Mexico. He was the Department's technical advisor when Attorney General Herbert Brownell led the studies of the issue and negotiated the 1973 agreement with Mexico.

Commissioner Friedkin, who also participated in the 1974 hearings in Congress on the empowering legislation, now has a statement on our technical concerns relating to S. 2202.

Thank you, sir.

Senator MURKOWSKI. Thank you, Mr. Crigler.

I think your emphasis on the issue with Mexico in describing it as the most serious issue to beset our relations puts this hearing in perspective.

It is appropriate, and we appreciate that testimony. Our next witness will be Mr. Joseph F. Friedkin, U.S. Commissioner of the International Boundary and Water Commission, United States and Mexico.

Please proceed.

## STATEMENT OF JOSEPH F. FRIEDKIN, U.S. COMMISSIONER, INTERNATIONAL BOUNDARY AND WATER COMMISSION, DEPARTMENT OF STATE

Mr. FRIEDKIN. I do appreciate this opportunity to appear before you with Ambassador Crigler as representatives of the Department of State and the U.S. Section of the International Boundary and Water Commission, to testify on S. 2202.

The Department and the U.S. Section understand that the amendments in S. 2202 are to authorize certain additional measures to assure accomplishment of the objectives of title II of the Colorado River Basin Salinity Control Act. These objectives are to guard against any serious increase in the salinity of the waters of the Colorado River upstream from Imperial Dam from the salinity concentrations prevailing there in 1972.

Let me note at the very outset that the Federal Government's participation in the title II program is not required for the United States to meet its commitments under the agreement with Mexico of August 30, 1973, for a solution of the international problem of the salinity of the lower Colorado River. At the hearings held prior to the approval of the 1974 Colorado River Basin Salinity Control Act, the Department and the Section supported title I—the programs downstream from Imperial Dam to enable the United States to comply with its obligations to Mexico under the 1973 Colorado River Salinity Agreement. We also supported the basinwide water quality standards requiring maintenance of 1972 salinity levels upstream from Imperial Dam, which title II of the act is designed to meet.

At those hearings, Ambassador Herbert Brownell, representing the President, testified that the title II measures, by guarding against increases in salinity at and above Imperial Dam, would not only benefit U.S. users diverting from the river at and upstream from that dam but would also provide incidental benefits to downstream users in Mexico. Indeed, should there be an increase in salinity at that dam there would be a corresponding increase in the salinity of the waters delivered to Mexico under the 1944 water treaty. At the same hearings, it was noted that the matter of standards for salinity control above Imperial Dam was a concern of Mexican officials in the course of negotiations for the salinity agreement. As Ambassador Crigler has stated, while the Department of State supports the concepts in this bill, it is neither qualified nor empowered to comment on matters of domestic concern contained in it, such as the manner of procedures, measures, and cost sharing proposed to achieve the bill's objectives. On those matters, we defer to the Departments of Interior and Agriculture.

Thank you, Mr. Chairman.

Senator **Murkowski**. Thank you, Mr. Friedkin, for your statement. I also should apologize to Mr. Crigler for not addressing him as Ambassador. I do apologize.

We will proceed with Commissioner Robert Broadbent, Commissioner of the Bureau of Reclamation, Washington, D.C., and I believe we have joining us Mr. Frederic Eidsness, Assistant Administrator for Water, Environmental Protection Agency, Washington, D.C.

Go ahead, Mr. Broadbent.

## STATEMENT OF HON. ROBERT N. BROADBENT, COMMISSIONER, BUREAU OF RECLAMATION, DEPARTMENT OF THE INTERIOR

Commissioner **Broadbent**. Mr. Chairman, it is again a pleasure on behalf of the Department of Interior to appear on S. 2202. Title II of the Colorado River Basin Salinity Control Act is intended to implement water quality measures for meeting Colorado River salinity standards which were adopted by the Colorado River Basin States and approved by the EPA in 1972.

The act authorized construction of four salinity control units and directed the Secretary of the Interior to expedite planning studies on 12 additional units.

Public Law 96-375 provided feasibility authorization for 10 of those units. Two of the authorized control units, Paradox Valley and Grand Valley, are currently under construction, while the Las Vegas Wash unit is being reformulated and the Crystal Geyser unit has been deferred because of unacceptable cost effectiveness.

The Department recognizes the salinity problem on the Colorado River and generally supports many of the concepts that have been included in S. 2202.

We welcome the introduction of this bill as a serious attempt to remedy deficiencies in the program which have become apparent since its inception 8 years ago.

The Department recognizes the need to control the salanity in the Colorado River Basin and to meet its commitment to Mexico of maintaining water quality standards.

The people of the Colorado River Basin States are concerned about the high salinity concentration which has an effect on the quality of drinking water, corrosion of facilities utilized by municipalities and industry, and losses in agricultural production.

It is, therefore, necessary that the people of the Colorado River Basin, industry, local and State governments and the Federal Government work together in seeking a solution to the salinity control problem.

Considerable basin-wide environmental enhancement could be accomplished through some of the measures proposed in S. 2202.

The administration does have objections to some sections of the bill and sees several major policy issues which we were unable to address before this hearing.

We would like to reserve the right to give you a complete administration position, with our recommended additions, deletions, modifications and technical amendments at a later date.

Let me outline our concerns for you. The fiscal implications of this legislation are of concern to the administration.

We have to better define the Federal Government's role in the title II program with respect to international and domestic commitments in relation to other water resources and water quality programs.

Moreover, salinity problems are pervasive in Western waters: tributaries to major Western river systems except the Columbia suffer from high levels of salinity.

We do not yet know the scope of salinity control measures that will be needed in years to come. A crucial related concern is the appropriate apportionment of costs between the involved parties.

As a general principle, we believe that beneficiaries should pay in proportion to benefits received, and producers of salinity should pay in proportion to damages caused.

However, we still need to work out the specific cost sharing arrangements suitable to salinity control activities of various types.

The Department believes that the salinity control program should not be subject to the proposed principles and guidelines of the Water Resources Council authorized by section 103 of Public Law 89-90 of the Water Resources Planning Act because subjecting the Salinity Control Program to a cost-benefit analysis could prevent the units from ever being constructed.

An evaluation based on cost effectiveness is more appropriate because the standards must be met by the most efficient and least costly means.

I might mention that as our studies of additional salinity control units for the Colorado River Basin have progressed over the past 8 years, the attractiveness of the onfarm programs has become apparent.

Those programs have demonstrated to be some of the most cost effective salinity control activities available. We defer to the Department of Agriculture on the most desirable modifications to current program structure and funding arrangements.

One additional area of concern that has been identified by the Department relates to the procedure of water rights for appropriating and using saline waters in the Colorado River Basin pursuant to the Colorado River Basin Salinity Control Act.

The 1974 act is silent on such procedures and it has been traditionally and continues to be the policy of the Department of the Interior, that such actions will be taken in strict conformance with State water laws.

However, as we proceed with ongoing implementation activities, it has come to light that certain provisions of State water law can and most likely would complicate development of some of the cost effective salinity control measures.

Since this is a matter of State purview, we recommend that the Colorado River Basin Salinity Control Forum actively address these issues and bring forward concepts and such action proposals as might be necessary to allow this program to proceed unimpeded by existing State water laws.

Finally, we cannot support authorization of six additional salinity control units until feasibility studies have been completed and reviewed by the executive branch.

We do, however, support inclusion of the Saline Water Use and Disposal Opportunities Unit has one of the planning reports at the feasibility level.

New ideas for saline water reuse such as local saline water use for energy production and coal-brackish water transport pipelines, identified in our September 1981 Special Report on Saline Water Use and Disposal, offer the promise of greater cost effectiveness as well as better resource management.

The Department believes that further investigations of these opportunities should not be delayed. We look forward to innovative joint ventures with industry in the use of saline water for economic benefit and salinity control.

Mr. Chairman, the conclusion of our statement refers to all of the sections, and it lists whether we generally support, defer or oppose, these sections.

And we would like to ask if we can make the whole statement a matter of record as well as our comments section by section.

Senator MURKOWSKI. The entire statement will be submitted for the record.

[The prepared statement of Commissioner Broadbent follows:]

**Statement of Robert N. Broadbent, Commissioner of the Bureau of Reclamation, Department of the Interior before the Senate Subcommittee on Water and Power of the Committee on Energy and Natural Resources on S. 2202 To Amend the Colorado River Basin Salinity Control Act to Authorize certain Additional Measures to Assure Accomplishment of the Objectives of Title II of such Act, and for other Purposes**

June 22, 1982

Mr. Chairman, members of the Subcommittee, on behalf of the Department of the Interior, I am pleased to appear here today to comment on S. 2202 which would amend the Colorado River Basin Salinity Control Act to authorize certain additional measures to assure accomplishment of the objectives of Title II of such Act, and for other purposes.

Title II of the Colorado River Basin Salinity Control Act is intended to implement water quality measures for meeting Colorado River salinity standards which were adopted by the Colorado River Basin States and approved by the EPA in 1972. The Act authorized construction of four salinity control units and directed the Secretary of the Interior to expedite planning studies on 12 additional units. (Public Law 96-375, dated 10/3/80, provided feasibility authorization for 10 of those units) Two of the authorized control units (Paradox Valley and Grand Valley) are currently under construction, while the Las Vegas Wash Unit is being reformulated and the Crystal Geyser Unit has been deferred because of unacceptable cost effectiveness.

Appraisal grade plans and cost estimates have been prepared for the 6 units included in S. 2202 and special or status reports have been completed. These units are the Lower Gunnison, McElmo Creek, Uinta Basin, Palo Verde Irrigation District, Saline Water Use and Disposal Opportunities, and Sinbad Valley Units. S. 2202 would provide for authorization for these units.

The Department recognizes the salinity problem on the Colorado River and generally supports many of the concepts that have been included in S. 2202. We welcome the introduction of this bill as a serious attempt to remedy deficiencies in the program which have become apparent since its inception eight years ago.

The Department recognizes the need to control the salinity in the Colorado River Basin and to meet its commitment to Mexico of maintaining water quality standards (see Minute 242 of the International Boundary and Water Commission). The people of the Colorado River Basin States are concerned about the high salinity concentration which has an effect on the quality of drinking water, corrosion of facilities utilized by municipalities and industry and losses in agricultural production.

It is, therefore, necessary that the people of the Colorado River Basin, industry, local and State governments and the Federal Government work together in seeking a solution to the salinity control problem. Considerable basin-wide environmental enhancement could be accomplished through some of the measures proposed in S. 2202.

The Administration does have objections to some sections of the bill, and sees several major policy issues which we were unable to address before this hearing. We would like to reserve the right to give you a complete Administration position, with our recommended additions, deletions, modifications and technical amendments at a later date. Let me outline our concerns for you.

The fiscal implications of this legislation are of concern to the Administration. We have to better define the Federal Government's role in the Title II program with respect to international and domestic commitments in relation to other water resources and water quality programs. Moreover, salinity problems are pervasive in Western waters: tributaries to major Western river systems except the Columbia suffer from high levels of salinity. We do not yet know the scope of salinity control measures that will be needed in years to come.

A crucial related concern is the appropriate apportionment of costs between the involved parties. As a general principle, we believe that beneficiaries should pay in proportion to benefits received, and producers of salinity should pay in proportion to damages caused. However, we still need to work out the specific cost sharing arrangements suitable to salinity control activities of various types.

The Department believes that the salinity control program should not be subject to the proposed Principles and Guidelines of the Water Resources Council authorized by Section 103 of PL 89-90 of the Water Resources Planning Act because subjecting the Salinity Control Program to a cost-benefit analysis could prevent the units from ever being constructed. An evaluation based on cost-effectiveness is more appropriate because the standards must be met by the most efficient and least costly means.

I might mention that as our studies of additional salinity control units for the Colorado River Basin have progressed over the past 8 years, the attractiveness of the on-farm program and the liability of programs to dispose of saline water have become apparent. Those programs have demonstrated to be some of the most cost effective salinity control activities available. We defer to the Department of Agriculture on the most desirable modifications to current program structure and funding arrangements.

One additional area of concern that has been identified by the Department relates to the procedure of water rights for appropriating and using saline waters in the Colorado River Basin pursuant to the Colorado River Basin Salinity Control Act. The 1974 Act is silent on such procedures and it has been traditionally and continues to be the policy of the Department of the Interior, that such actions will be taken in strict conformance with State water laws. However, as we proceed with ongoing implementation activities, it has come to light that certain provisions of State water law can and most likely would complicate development of some cost-effective salinity control measures. Since this is a matter of State purview, we recommend that the Colorado River Basin Salinity Control Forum actively address these issues and bring forward concepts and such action proposals as might be necessary to allow this program to proceed unimpeded by existing State water laws.

Finally, we cannot support authorization of six additional salinity control units until feasibility studies have been completed and reviewed by the Executive Branch. We do, however, support inclusion of the Saline Water Use and Disposal Opportunities Unit as one of the planning reports at the feasibility level (Public Law 93-320, Section 203 (a) (1)) in addition to the already existing feasibility study authority under the 1974 Act for salinity control units such as the Palo Verde Irrigation District Unit.

New ideas for saline water reuse such as local saline water use for energy production and coal-brackish water transport pipelines, identified in our September 1981 Special Report on Saline Water Use and Disposal, offer the promise of greater cost-effectiveness as well as better resource management. The Department believes that further investigations of these opportunities should not be delayed. We look forward to innovative joint ventures with industry in the use of saline water for economic benefit and salinity control.

Following are our specific comments on each section of the proposed legislation, S. 2202, with the Department's position.

| | |
|---|---|
| Section (1) | removes the requirement to follow principles, standards and procedures for planning water and related land resources promulgated pursuant to the Water Resources Planning Act. |
| Position | **SUPPORT**<br>This salinity control program should not be subject to the principles, standards and procedures for water projects using a cost-benefit analysis because subjecting the salinity control units to a cost-benefit test could prevent them from ever being constructed. The Principles and Guidelines were not drafted for this purpose and, therefore, a cost-effectiveness approach is more appropriate. |
| Section (2) | directs the Secretary to give preference to units of self-contained portions of units that provide salinity reduction at the least cost per unit of salinity reduction. |
| Position | **SUPPORT**<br>The most cost-effective units should be given preference. |
| Section (3) | restructures the act to allow additional Interior and Agriculture programs, as contained in sections (7) and (8). |
| Position | **SUPPORT**<br>This is simply an editorial change to restructure the act. |
| Section (4) | allows Grand Valley Unit canals and laterals to be replaced with pipe in addition to concrete lining open canals and allows additional measures to reduce salt contributions. |
| Position | **SUPPORT**<br>In the past, this has been viewed as a more cost-effective and more locally acceptable salinity control straegy. Preliminary results of the Grand Valley construction confirm that salinity can be reduced and water conservation enhanced through these methods. |
| Section (5) | pertains to the Grand Valley salinity control unit, and deletes the Secretary's authority to have a technical staff to assist users in water conservation for five years after money first becomes available under this title of the Act and to enter into agreements with the Secretary of Agriculture for a unified control plan. It also deletes the direction for the Secretary of Agriculture to cooperate in on farm measures for salt reduction; section (8) of the bill provides a new on farm program in lieu of the less comprehensive program envisioned in 1974. |

Position

SUPPORT
The authority of the Secretary of the Interior expired in 1979. Experience has shown that the Department of Agriculture can do this job in a more effective manner than Reclamation.

Section (6)

adds the conditional authorization (with oversight by the Administration and Congress) for six additional salinity control units.

Position

OPPOSE
We cannot support authorization of six additional salinity control units until feasibility studies have been completed and reviewed by the Executive Branch. We do, however, support inclusion of the Saline Water Use and Disposal Opportunities Unit as one of the planning reports at the feasibility level (P.L. 93-320, section 203(a)(1)) in addition to the already existing feasibility study authority under the 1974 Act for salinity control units such as the Palo Verde Irrigation District Unit.

Section (7)

directs the Secretary to contract with nonfederal quanified entities for cost sharing where it is in the best interest for maximum reduction in salinity; restricts the Secretary's authority to assume long term obligations for improved canals and laterals and measures to replace incidental wildlife values; authorizes the Secretary to improve additional interconnected canal and lateral sections where local entities provide appropriate repayment (subject to the Leavitt Act on Indian lands); authorizes replacement of incidental wildlife values; provides for submission of final implementation plans to the appropriate congressional committees and Governors.

Position

GENERALLY SUPPORT
A substantial Federal savings could result through joint ventures with nonfederal entities who would equitably share in the cost of salinity control. The proposed measures for the replacement of incidental wildlife values provide a reasonable approach to maintaining those resources. The Administration does not support the provision on the necessity for oversight by the Congress on final implementation plans. Subsection (3) requires more study because of the cost-sharing questions involved in Small Reclamation projects.

Section (8)

authorizes the Secretary of Agriculture to estabish an on-farm salinity control program including source identificatin, plan development, technical and cost sharing assistance, irrigation water management and monitoring and related research demonstration and educational activities. Also included are reports to Congress, authorization of appropriation of about $200 million for 1983-1988 and a restriction on long term operation and maintenance commitments.

| | |
|---|---|
| Position | **DEFER TO THE DEPARTMENT OF AGRICULTURE**<br>Interior believes that a maximum authorization of appropriations needs to be established to allow the setting of related power rates for repayment purposes. |
| Section (9) | directs the Secretary to develop a comprehensive plan to minimize salt contributions from BLM lands and to submit a report to Congress and the Advisory Council by July 1, 1984. |
| Position | **SUPPORT**<br>We need a BLM study because the Federal Government has a responsibility to control the salinity constrbuted to the Colorado River system by Federal lands. |
| Section (10) | excludes from the repayment formulas conmtributions from industries that use saline water and farmers who provide up-front cost-sharing for onfarm programs. |
| Position | **SUPPORT**<br>We support up-front contributions or the inclusion of an interest rate provision in the repayment formula. |
| Section (11) | clarifies that the repayment period shall be for a 50-year period or the life of the facility, whichever is less. |
| Position | **DEFER**<br>We recognize that some facilities have a life of less than 50 years and ought to be repaid more quickly. We believe the repayment period should have a maximum time limit of 50 years. Before the repayment schedule is determined, the cost-sharing issue must be resolved. |
| Section (12) | deletes the Secretary's authority under Public Law 93-320 to modify authorized units. |
| Position | **OPPOSE**<br>The Secretary of the Interior needs that authority to be able to adopt more cost effective strategies as they are identified. |
| Section (13) | editorial change to recognize the addition of a new section (202(b)). |
| Position | **SUPPORT**<br>This is simply an editorial change. |
| Section (14) | authorizes the Secretary to use funds appropriated by section 208 of P.L. 93-320 for construction of any or all of the works or portions thereof and for any other purposes authorized. |

Position **SUPPORT**

This would allow the best use of the existing maximum authorization of appropriations. (This is consistent with our support of section (2).).

In the months ahead, we must determine the extent of the Federal role in these programs and define equitable cost-sharing arrangements among the parties involved. We look forward to working with the Committee to assure that the most cost-effective approach for achieving program objectives is identified and implemented in such a time frame as to meet established water quality standards.

This concludes my statement, Mr. Chairman. I would be pleased to answer any questions.

x x x x x x

Senator **Murkowski**. I want to thank you, Commissioner, for your testimony. I might make reference to an early statement with regard to the four control units that are presently either under construction or in the process of some renovation.

I believe that those were authorized in 1974.

Commissioner **Broadbent**. Yes, sir.

Senator **Murkowski**. Can you tell us the expenditures to date on those four control units?

Commissioner **Broadbent**. I would have to submit it to you for the record.

[The information was not received.]

Senator **Murkowski**. Do you have any idea?

Commissioner **Broadbent**. About $30 million, I am told.

Senator **Murkowski**. $30 million total. And I gather from your testimony that Paradox Valley and Grand Valley are under construction at this time?

Commissioner **Broadbent**. Yes, sir.

Senator **Murkowski**. How much more money is going to be needed to make them operational?

Commissioner **Broadbent**. About $330 million.

Senator **Murkowski**. So we are far from home.

Commissioner **Broadbent**. Yes, sir.

Senator **Murkowski**. We have spent $30 million on four and on two we need $330 million to complete them and make those two operational; is that generally about right?

Commissioner **Broadbent**. That is right.

Senator **Murkowski**. And the Las Vegas wash unit is being reformulated. Where is that?

Commissioner **Broadbent**. That is near my home, and I can speak about it. When the Las Vegas Wash unit was originally planned there was going to be a desalinization plant.

Saline water from the wash ran down into the lake and built up a lot of salt loading. We are seeing now over the past years a disappearance of that salt loading.

The investigators felt it might have been a result of some of the old Henderson plants that were built during the war which put an awful lot of salt into the domes in the area of Las Vegas Wash.

So now they are talking about building really a canal that would bypass the water in Las Vegas Wash. It would be much less expensive and would probably do about 80 or 90 percent of the work.

Senator **Murkowski**. So they propose a bypass. How much money has been expended already on the Las Vegas Wash unit?

Commissioner **Broadbent**. About $3 million.

Senator **Murkowski**. And evidently that $3 million has not been proven.

Commissioner **Broadbent**. Most of that was spent in studies. It is now indicated that the bypass canal plan is more feasible.

Senator **Murkowski**. How much would the canal cost?

Commissioner **Broadbent**. I am not sure we are that far along on it. It would be about $10 million. It was estimated to be about 10 percent of the original cost for a desalinization plant and we would receive about 80 percent of the benefits.

Senator **Murkowski**. When is the study going to be done so you will have conclusive recommendation on whether the canal is the appropriate way to handle the Las Vegas Wash?

Commissioner **Broadbent**. I think in general we are willing to recommend the canal. I think most of the problem has been working with the State governments.

I think they are very close to an agreement on this right now.

Senator **Murkowski**. What is the problem with the State governments?

Commissioner **Broadbent**. Well, there is a little bit of a battle between two local government's on how to handle the water quality problems out there, I think they are coming to a resolution on it.

It involves more than ust salinity; it involves salt loading, water quality standards, construction of a very expensive waste treatment facility that was recommended by EPA and some other things.

Senator **Murkowski**. Tell us about the Crystal Geyser unit, which I gather has been deferred because of unfavorable costs.

Commissioner **Broadbent**. It was just too expensive for the reduction in salt load you would receive:

Senator **Murkowski**. How much was that proposed to be?

Commissioner **Broadbent**. $2.6 million. I am told we spent something around $100,000 to $200,000. The problem is, when the four projects were authorized, they were authorized without feasibility studies, and we had to initiate feasibility studies on them.

At the time we were conducting the feasibility studies there was some reformulation and other revisions required.

Senator **Murkowski**. Is it the intention of your office, the Department of the Interior, Bureau of Reclamation, to—are you satisfied that you have these feasibility studies to recommend the continued funding up to—well, I think you said $330 million on two: Paradox Valley and Grand Valley, and another $10 million on the Las Vegas Wash, or are you in a position to comment on that?

Commissioner **Broadbent**. We have the budgeted money in our 1983 budget, which is the administrations budget, which will give us the money to go ahead and complete the studies required to determine the most cost effective plan.

Then on the basis of these studies we will be able to go ahead through construction. If there were other projects that we felt were cost effective we could to go ahead with studies on them.

We have money in our 1983 budget and are considering continued funding in 1984 to carry out the Grand Valley and Paradox Valley construction.

Senator **Murkowski**. So you have $330 million?

Commissioner **Broadbent**. No, not that complete amount. We are just completing phase I of the Grand Valley unit, and we would probably be entering into phase II after that. It is a phased construction.

Senator **Murkowski**. At what point would you become operational? Would you become operational partially in phase I?

Commissioner **Broadbent**. Yes, sir. Part of Grand Valley is operational right now.

Senator **Murkowski**. What has been your operational experience with Grand Valley?

Commissioner **BROADBENT**. In general, it is a matter of lining some of the ditches and installing some pipes. Our operational experience so far has been very good.

Additionally, we feel the experience that some of the farmers have had looks very, very good from our perspective, and I think you will hear more from some of those people.

Senator **MURKOWSKI**. Do you think it is cost effective at this time?

Commissioner **BROADBENT**. This type of work is probably one of the most cost-effective portions of the project we could have.

Senator **MURKOWSKI**. In your testimony later you indicate that you cannot support authorization of six additional salinity controls projects until feasibility studies have been completed.

I assume that is based on your experience with the four we have discussed.

Commissioner **BROADBENT**. Yes, sir.

Senator **MURKOWSKI**. When would you anticipate that coming by?

Commissioner **BROADBENT**. We would work on all of those feasibility studies and hope to recommend to you a bill for construction authorization. If the studies indicate the projects to be cost effective, we would be ready for initiation construction at the appropriate time. We don't want to hold it up but, we don't want to authorize a construction project if the feasibility studies indicate it isn't cost effective.

Senator **MURKOWSKI**. I am concerned about the statement of Ambassador Crigler regarding relations with our friends to the south, Mexico, which apparently points out that we have got a very critical problem here: the realization that we have been on this since 1974, the anniversary of the first 10 years next year and we are still somewhere away from completing the four that are authorized when we have got a proposal in the bill of six additional projects.

That kind of a timeframe against the critical situation as far as salinity in Colorado, particularly lower Colorado, where are we in this timeframe in the realities associated with our relationship with Mexico?

Commissioner **BROADBENT**. I think that is the concern of all of us here at the table today. We are actively working on another part of this act, title I. We are building a very expensive desalinization plant to hopefully answer our problems with our friendly neighbors in Mexico.

I would say that we in the Bureau of Reclamation are concerned. We want to be able to get these facilities built so we can meet the requirements we not only have with Mexico, but the requirements that all of the basin States have to meet numerical standards under the Clean Water Act.

So we are moving ahead. Our organization in the last 3 or 4 years has put a very high priority on salinity control.

Our contruction schedule and some of our work has gone ahead faster than some of our other projects. In the early days, when we were formulating a lot of this work, it was very tough and we didn't have the needed studies done.

But I think we are in a position to move out rather rapidly, given the resources and with solutions to some of the salinity control problems, such as solving some of the water rights problems which could be detrimental to completing our work if we don't get those out.

And if we get a bill like this, I think we can move ahead rather quickly.

Senator MURKOWSKI. Thank you, Commissioner.

Commissioner BROADBENT. There is an additional thing, if I might, and that is, the interesting programs that have come under the use of saline water from the Big Sandy for fertilizer development.

And we have some interesting developments for the use of saline water by energy companies. We really want to pursue that because the W. R. Grace proposal, if it becomes a reality, can take out 10 percent of the salt loading in the Colorado River and use this water for beneficial purposes such as the transfer of coal and relieve us of 10 percent of the salinity in the Colorado River.

These are some of the exciting proposals we think might come forward and could effectively move this program rather rapidly.

Senator MURKOWSKI. I thank you, Commissioner. I think that comment, the utilization of that water, may eschew the concerns of the Western States.

That might be the answer.

Commissioner BROADBENT. It is a coal transport system, not a coal slurry pipeline.

Senator MURKOWSKI. I am sure we will hear from others on that proposal, and I gather from your comments that we can learn a good deal from the experience we have had with the four projects that have been authorized.

I guess my observation is one of some question with regard to the timeframe it takes to do the feasibility study and get into production with those plans.

We have been 10 years, approximately, and I gather you are still not satisfied that those four authorized operations had appropriate or even final feasibility studies made.

They were more or less put together, I guess, as you proceed. That was indeed unfortunate.

Commissioner BROADBENT. One of the tough problems is that it is pretty easy to identify point sources of pollution especially like the one in Paradox Valley or some of the other point sources along the Colorado River.

It is fairly easy to get some of that saline water out of the river, but the real problem is what do you do with it when you get it out of the river.

So that is why we are looking at W. R. Grace. We have looked at deepwell injection, evaporation, and all kinds of things, but some of those are extremely expensive.

Senator MURKOWSKI. Thank you, Commissioner. We will move on to Peter C. Myers, Chief, Soil Conservation Service, U.S. Department of Agriculture.

Will you be accompanied by Mr. Rank?

Mr. MYERS. Mr. Rank isn't here.

## STATEMENT OF PETER C. MYERS, CHIEF, SOIL CONSERVATION SERVICE, DEPARTMENT OF AGRICULTURE

Mr. MYERS. Thank you. On behalf of the Secretary of Agriculture, we appreciate the opportunity to appear before your committee along with representatives from the Departments of the Interior and State and the Environmental Protection Agency, to discuss the proposed amendments to the Colorado River Basin Salinity Control Act, Senate bill 2202.

In the interest of time, we do have a prepared statement.

Senator MURKOWSKI. Without objection, it is so ordered.

Mr. MYERS. You are well aware of the salinity problems. We won't dwell on the technical aspects of the problem, but we have people here to answer any questions.

The Department of Agriculture, through the various agencies, has been involved in the Colorado River salinity problem since 1974. I feel SCS has been very effective in providing technical assistance to farmers.

The administration feels that several features of Senate bill 2202 need further study, and we would like to reserve the right to provide you with a detailed position and suggested changes at a later date.

In the interest of time, Mr. Chairman, that concludes my oral presentation. If you have any questions, we will be glad to answer them.

[The prepared statement of Mr. Myers follows:]

Statement

by

Peter C. Myers, Chief, Soil Conservation Service

U.S. Department of Agriculture

Before the Senate

Subcommittee on Water and Power of the

Committee on Energy and Natural Resources

on

S. 2202, Amendments to the

Colorado River Basin Salinity Control Act of 1974,

Public Law 93-320

June 22, 1982

## INTRODUCTION

Mr. Chairman and members of the subcommittee, I am Peter C. Myers, Chief, Soil Conservation Service, U.S. Department of Agriculture (USDA). On behalf of the Department of Agriculture and Secretary Block, I would like to express our appreciation for the opportunity to appear before your committee along with representatives from the Departments of Interior and State and the Environmental Protection Agency (EPA) to discuss the proposed amendment to the Colorado River Basin Salinity Control Act, Senate Bill 2202. Before commenting on the legislation, I would like to provide an explanation of the salinity problem and a brief description of

USDA involvement in this unique, multidepartmental program. This will provide a foundation for better understanding the impacts of the proposed amendments.

## THE SALINITY PROBLEM

Salt problems are by no means limited to the Colorado River. Some 20 percent of the soil in the western States have salinity problems. This is a natural phenomenon, that is exacerbated by irrigation. Therefore, in designing an approach to the Colorado River, we must be careful to consider the implications for this vast additional area.

With respect to the Colorado River, however, the salinity concentrations at the headwaters in Colorado and Wyoming average about 50 milligrams per liter (mg/l). As the waters move through the river system, salinity concentrations continue to increase to an average annual concentration of about 820 mg/l at Imperial Dam, just north of Yuma, Arizona. Salinity concentrations of the Colorado River entering Mexico have reached 1,500 mg/l. This was attributed partially to upstream Colorado River contributions, plus the irrigation return flows of the Welton-Mohawk Irrigation and Drainage District, near Yuma, Arizona. About half of the salt entering the river comes from natural sources, and the other half from man's activities, principally irrigation. As the Colorado River is depleted, salt concentrations also increase, to the detriment of downstream water users.

The merits of salinity control have been effectively demonstrated by the current projects of the Departments of Interior and Agriculture carried out since implementation was authorized in 1974. These include the Welton-Mohawk project in Arizona authorized under Title I and the projects in Grand Valley, Colorado, and the Uinta Basin of Utah authorized under Title II of the Colorado River Basin Salinity Control Act of 1974, Public Law 93-320. These efforts have clearly demonstrated that both onfarm and structural approaches will be required to meet the long-term water quality objectives in terms of total salt load reduction. It is equally clear, that with the higher capital costs associated with structural measures, that the cost effectiveness of implementation in a salt source unit must be based on both structural and onfarm measures.

## USDA INVOLVEMENT

USDA agencies have been involved in Colorado River salinity control since 1974. Through agencies such as the Soil Conservation Service (SCS), Agricultural Research Service (ARS), Extension Service (ES), Cooperative State Research Service (CSRS), and Agricultural Stabilization and Conservation Service (ASCS), USDA has played a major role in formulating and developing an effective approach to reducing salt loads to the Colorado River from onfarm irrigated agricultural croplands and related farm laterals and irrigation canals.

To date, USDA activities have included salinity control studies and implementation reports, continued research, demonstration and education, plus technical and financial assistance for the Grand Valley, Colorado, and Uinta Basin, Utah, salt source units.

SCS has conducted detailed salinity control studies on priority irrigation salt source areas within the river basin. Within the 17 identified salt source areas, there are approximately 1 million acres of irrigated cropland. Six plans have been completed on over 400,000 acres in five different States. These are Grand Valley (Colorado), Uinta Basin (Utah), Big Sandy (Wyoming), Moapa Valley (Nevada), Lower Gunnison (Colorado), and Virgin Valley (Nevada, Arizona). The six completed plans have a combined projected average annual salt load reduction of over 700,000 tons. This translates into an estimated 88.1 mg/l reduction at Imperial Dam and at completion would produce offsite benefits of over $45.0 million per year.

SCS and ASCS have been supporting the Grand Valley and Uinta Basin implementation projects through the use of SCS Conservation Technical Assistance and River Basin funds and ASCS's Agricultural Conservation Program (ACP) since 1979.

The existing onfarm salinity control efforts of the Department of Agriculture in Colorado and Utah have relied on the existing program authorities as directed by the Act. We recognize that some additional flexibility may be needed in present authorities to deliver financial assistance in the onfarm salinity control program, such as the annual limitation in cost sharing with individuals and being restricted to assisting only agricultural producers.

## LEGISLATION

With regard to the onfarm agricultural program, the basic objective of S. 2202 is to provide the Secretary of Agriculture with specific authorities to establish a voluntary onfarm salinity control program. We believe that the provisions in S. 2202 which requires preference be given based on cost effectiveness is an important principle that may be helpful in budget coordination. But we believe that further study is required.

What portion of the cost of Colorado salinity mitigation should be paid by the general taxpayer and what portion should be paid by those who cause increased salinity and those who benefit from reduced salinity is an issue that we wish to examine further. We will provide our recommendation on this issue later.

The Administration recognizes that existing USDA programs may need some modifications to deal with the complex and unique set of problems that exist in the Colorado River Basin. S. 2202 is an effort to find a solution to these problems, and provides a good departure point for discussions between the Administration and Congress. The Administration also recognizes that the present authorities of the Secretary of Agriculture are broad, and that some changes can be made in the current program without additional legislation.

There are many river basins in the western States which have salinity problems. To establish a separate USDA onfarm treatment salinity program for the Colorado River Basin would provide a precedent that could lead to a proliferation of separate programs in USDA to deal with salinity problems wherever they occur.

The Administration has some concerns with S. 2202 as it is currently drafted, and we would like to reserve the right to provide you with a detailed position and suggested changes at a later date.

It has been established that onfarm irrigation improvement and water management is more cost-effective than many structural salinity control measures. For this reason, an onfarm program is a desirable component of any overall salinity control effort.

Senate Bill S. 2202 (beginning on page 8, subsection (8)) includes some provisions that we believe warrant further consideration. The bill would give the Governors of the involved States and the Advisory Council a role that would enable them to control, through recommendations and/or veto, the expenditures of Federal funds. We believe that these provisions together with the requirement to come to agreement with a committee of Congress poses constitutional questions.

The bill provides for specific year-by-year funding levels. These figures assume a full 10-year implementation program by salt source area. We also are concerned that the borrowing authority of the Commodity Credit Corporation not be used for the purpose of this Act.

The Department of Agriculture has determined that the procedures defined for the Department of Interior for wildlife mitigation are inappropriate to the voluntary onfarm program. Changes might be considered to maintain the intent but eliminate the need for request and concurrence by the Advisory Council and the Governor on each onfarm contract or agreement.

The Department intends to use existing agencies to carry out most of its responsibilities. We will consider ways that would allow the use of grants and contracts to carry out some of the identified activities. Specifically, we might need the flexibility to deal with conservation and irrigation districts, colleges and universities, and other units of State and local government in a manner consistent with State law - something that cannot be accomplished solely with financial incentives and Federal technical assistance.

## CONCLUSION

We will be happy to provide a complete Administration position with appropriate recommended additions, delations, and amendments at a later date.

**Senator MURKOWSKI.** Thank you, Mr. Myers. You indicate a qualified support of the bill, subject to further study.

I wonder if you would elaborate a little more on that further study based upon the observation of the four projects.

**Mr. MYERS.** Not necessarily observation of the specific four projects; some of the program features that give us concern such as the question of using borrowing authority of the Commodity Credit Corporation, and the up-front funding of projects for 10 years.

We are also concerned about looking at cost share levels to landowners that would be necessary to get them to participate whether 75-25, whether 60-40 or 50-50.

**Senator MURKOWSKI.** Have you recommendations?

**Mr. MYERS.** We have no specific recommendations at this time.

**Senator MURKOWSKI.** But you will submit it for the record during the 10-day period that the record will remain open?

**Mr. MYERS.** Yes, we will.

[The information was not received.]

**Senator MURKOWSKI.** Are you familiar with the other four projects?

**Mr. MYERS.** Yes, they are, and I am familiar with the irrigation aspects of it.

**Senator MURKOWSKI.** Would you support the bill in its present form?

**Mr. MYERS.** As written, no, sir, we can't without making some further study and some changes.

**Senator MURKOWSKI.** Will you make specific recommendations for the record and can you say now whether or not with those recommendations you can support an amended bill?

**Mr. MYERS.** I can't say now until we have completed our analysis and suggested changes.

**Senator MURKOWSKI.** I guess my question is, Assuming you can make the changes upon the recommendations of your people, is your ultimate recommendation going to be in support of the bill with the changes made by you or your Department?

**Mr. MYERS.** With the suggested changes, we would hope we could support the bill. We would have to study further some of the specifics.

**Senator MURKOWSKI.** Have you had an opportunity to review the bill?

**Mr. MYERS.** Yes, sir, we certainly have.

**Senator MURKOWSKI.** Why haven't you recommended changes?

**Mr. MYERS.** We have had some second thoughts, and we have decided we should qualify our statement.

**Senator MURKOWSKI.** How long does it take to do that?

**Mr. MYERS.** I hope within the 10 days you have just alluded to. We will do that in 10 days.

**Senator MURKOWSKI.** The bill has been introduced since March so I assume you have had plenty of opportunity. Is OMB a factor in the recommendations from your Department?

**Mr. MYERS.** We consult with OMB, yes.

**Senator MURKOWSKI.** You consult with them and, consequently, they consult with you, and do they pretty well dictate your position?

**Mr. MYERS.** They have influence on our position.

Senator MURKOWSKI. They have influence on your position. Have they had influence on your position today?

Mr. MYERS. Yes, sir.

Senator MURKOWSKI. I see. That is interesting, yet there is nobody from OMB who is here who is prepared to testify today, is there?

Mr. MYERS. Not to my knowledge.

Senator MURKOWSKI. I might ask Mr. Brown did OMB ask or were they aware of this hearing?

Mr. BROWN. Yes.

Senator MURKOWSKI. Did they ask to testify?

Mr. BROWN. You asked if they would send a witness.

Senator MURKOWSKI. What did they say?

Mr. BROWN. They declined.

Senator MURKOWSKI. I find it extremely peculiar and quite upsetting that OMB takes this position. It is not the first time that I have seen this in recent days.

I assure you, speaking as one Senator and subcommittee chairman, that this particular type of tactic I find most disagreeable.

I think it is the responsibility of the Government agencies to make recommendations based on their own professional expertise within those departments.

OMB has a job to do, but I don't think it is to dissuade those professionals from coming out with specific recommendations based on their individual expertise, and I would like that so noted in the record.

I would ask that you, Mr. Myers, will be queried by me and/or the professional staff as to whether or not your ultimate recommendation is based on a dictate or a strong suggestion from OMB.

Mr. MYERS. Are you asking me?

Senator MURKOWSKI. You will be asked upon receipt of your recommendation, which I assume is coming in within the 10-day period, specifically whether or not that recommendation was based on a dictate or mandate or some strong suggestion from OMB.

Is that fair enough?

Mr. MYERS. Fair enough. Thank you, sir.

Senator MURKOWSKI. I think if there is any undue coercement or pressure by OMB it should be brought out at these hearings.

I don't think it is necessarily something that should be handled in this manner. Perhaps at another time we ought to have a hearing on the function and obligation of OMB.

That should be an interesting one. I wonder if they would show up for that? Our next witness is Mr. Frederic Eidsness, Assistant Administrator for Water, Environmental Protection Agency, Washington, D.C.

Good morning, Mr. Eidsness.

## STATEMENT OF FREDERIC A. EIDSNESS, JR., ASSISTANT ADMINISTRATOR FOR WATER, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. EIDSNESS. Thank you, Mr. Chairman, for asking me to be here and to represent the U.S. Environmental Protection Agency.

I have a rather lengthy and somewhat technical piece of testimony which I would like to submit for the record and, in the interest of time, I would like to highlight certain points of the testimony.

I would like to preface my testimony by citing the need for the Colorado River Basin water, both now and in the years to come.

More than 15 million people in the metropolitan areas in the basin and adjoining areas, and in southern California depend on the Colorado River for their drinking water.

A half-million people in Mexico have an interest, which is guaranteed by international agreement, in the quality and quantity of water from the Colorado.

The agricultural community in the basin requires quality water for irrigation; the future development of the basin's energy resources will require a greater share of the basin's water.

This pressure from literally millions of people who depend on the basin's water for their life and livelihood has raised the concerns of the Congress, EPA, and the States over the basin's water quality.

As I indicated earlier, my testimony is quite lengthy and it covers, very briefly, the vital statistics of the basin; the water quality obligations to Mexico; the multiple and complex sources of the basin's salinity problems; the evolution of the Clean Water Act's procedures for setting water quality standards; the cooperative efforts of the basin States in establishing equitable salinity standards; and EPA's conclusions on meeting the needs of the people who depend on the Colorado River for water.

I would like to jump ahead and highlight key points in my testimony.

Senator MURKOWSKI. Please proceed.

Mr. EIDSNESS. Irrigation is the major consumer of water in the basin and is responsible for the largest manmade increases in salinity.

Salt is concentrated when water is removed through evaporation and consumption by irrigated crops, but practically all of the dissolved salt is returned to the river.

A 1974 EPA study of major salinity problems resulting from irrigation practices cited the Colorado River Basin as having more salinity problem areas than any other river in the Nation. The study reported that nearly 90 percent of the Colorado's salt load caused by irrigation came from the upper basin's 1.6 million acres of irrigated farmland.

This acreage, less than 3 percent of the upper basin's land area, generated from 24 to 41 percent of the entire basin's total salt load of 8.15 million tons, as measured at Lee Ferry, Ariz., between 1941 and 1966.

The reduction of salt loads through improvements in irrigation practices and systems should be given top priority consideration.

For example, one of the most serious salinity sources in the basin which was identified in EPA's 1974 study is in the Grand Valley area at the confluence of the Gunnison River and the Colorado.

Here irrigation waters are being percolated by various paths to a highly saline aquifer and are then being returned to the Colorado due to the abnormally high ground water table caused by excessive irrigation.

This cycle is estimated to contribute 704,000 tons of salt to the river annually. Thus, Grand Valley's 88,000 irrigated acres, about one-tenth of 1 percent of the upper basin's land area, is contributing 18 percent of the entire basin's irrigated agriculture salt load.

Programs to improve irrigation practices through reduction of water use and irrigation ditch improvements to stop leakage are obvious methods which could be used to reduce the large salt loads from the Grand Valley.

Water quality standards are the foundation of a State's water-quality management process. The State water quality management process varies from State to State, and the phrase is used here to describe the general mechanism States use to integrate the various programs under the act into a coherent management framework.

As part of the water quality management process, States define their water quality goals by setting standards for their waters.

They design and implement water-quality-based pollution control programs to insure that the standards are attained. Water quality standards guide the development of water quality management plans, serve as the basis for waste load allocations and determine the additional reduction in pollutant loadings necessary to protect or attain uses where technology-based controls are inadequate.

The process for the adoption of water quality standards by the States begins at the local level. The States develop the standards, which are then reviewed and approved by EPA.

To insure the continuing appropriateness of the standards, the States are required to review them every 3 years. In addition, the States are encouraged to review the attainability of the standards through the local planning process established under the provisions of the Clean Water Act.

As a result of the 1972 amendments to the Clean Water Act, EPA required the States to develop numeric criteria for salinity on the Colorado River.

Consequently, in the fall of 1973, EPA submitted to several of the Colorado River Basin States suggestions regarding proposed requirements and procedures for salinity control in the Colorado River Basin, including the establishment of an interstate organization to develop a salinity control plan.

The basin States, in response to EPA's suggestion regarding the proposed requirements, and in consideration of several other questions that had been generated relative to certain sections of Public Law 92-500, met in 1973, and among other things formed the Colorado River Basin Salinity Control Forum.

EPA has placed a high priority on salinity control through its water quality management program. The regional EPA offices have funded significant projects in Wyoming, Utah, Nevada, and Colorado that have developed nonpoint source controls.

The WQM program has provided data and coordination for discharge permits issued in the Colorado Basin and has provided support to States in developing strategies for focusing their salinity control activities.

EPA has also funded, with the States, an Executive Director for the Forum: This grant ends in September 1982 at which time the States have agreed to provide complete support for the Forum's Executive Director;

Individually, the basin States have developed water quality management plans to conform to the requirements of section 208 of the Clean Water Act.

The water quality management planning process is continuing. As the plans are refined and after many changes have been adopted by the States and approved by EPA, those portions of the plans dealing with salinity control have become part of the implementation plan.

It is important that EPA and the other Federal agencies involved in the effort to correct the Colorado salinity problem recognize and make use of the work of the local, areawide, and State WQM agencies.

The planning studies prepared by these agencies under sections 208 and 303 of the CWA have shown that many cost-effective measures for salinity and other pollution control are nonstructural and low cost.

For example, irrigation scheduling has been found to significantly reduce the salinity in irrigation return flows. The value of nonstructural measures and practices has been demonstrated through the model implementation program, the rural clean water program and other EPA supported research.

It is not likely that the numeric criteria will be exceeded during the next 3-year review period. However, because of the extremely long lead time required to conduct salinity studies, complete feasibility reports, authorize and complete construction, and to achieve full impact at lower main stem stations, it is essential to continue efforts to expeditiously implement all feasible salinity control measures.

Through the technical evaluation and analysis needed for setting water quality standards and in developing a water quality management planning process for the basin, the salinity problem has been confirmed as a threat to the water supply upon which millions of people in the seven State basin areas are dependent.

The Colorado River is a practical example of the Clean Water Act at work in responding to a major water quality problem.

The act sets out a process for setting standards and follows through with a way to achieve the standards as well. In this instance the Colorado River is important to all aspects of life in the seven State basin area.

The water quality standards for the Colorado River have been developed and accepted by the States through a cooperative public process and have been approved by EPA after a thorough technical review.

Through the Forum, EPA was able to work very closely with the States in establishing the standards. EPA also supported the development of water quality management planning process to achieve and maintain the established standards.

EPA strongly endorses the cooperative Federal/State efforts which have been developed through the WQM planning process to control salinity and other nonpoint source problems in the basin.

The USDA's on-farm programs are among the most cost-effective salinity control programs. In some instances, implementation of complimentary Department of the Interior programs, especially irrigation management, canal or lateral ditch lining, are prerequisite to implementation of USDA's on-farm programs.

Therefore, it is critical to closely coordinate Department of the Interior activities as representatives of the Department of Agriculture have already testified.

Mr. Chairman, this concludes my statement. I would be happy to answer any questions you or others may have.

Senator MURKOWSKI. Thank you, Mr. Eidsness.

[The prepared statement of Mr. Eidsness follows:]

# STATEMENT OF
# FREDERIC A. EIDSNESS, JR.
ASSISTANT ADMINISTRATOR FOR WATER
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON WATER AND POWER
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE
JUNE 22, 1982

Mr. Chairman and members of the Subcommittee, I am Frederic A. Eidsness, Jr., the Assistant Administrator for Water for the Environmental Protection Agency. I will review with you today the interstate and international impacts of the Colorado River Basin salinity problem, and also summarize EPA's involvement with the seven Basin States in the continuing efforts to establish salinity criteria and controls for the Basin.

I want to preface my testimony by citing the need for the Colorado River Basin water both now and in the years to come.

- More than 15 million people in the metropolitan areas in the Basin and adjoining areas, and in Southern California depend on the Colorado for their drinking water.
- A half-million people in Mexico have an interest, which is guaranteed by international agreement, in the quality and quantity of water from the Colorado.

- The agricultural community in the Basin requires quality water for irrigation.
- The future development of the Basin's energy resources will require a greater share of the Basin's water.

This pressure from literally millions of people who depend on the Basin's water for their life and livelihood has raised the concerns of the Congress, EPA, and the States over the Basin's water quality.

In the body of my testimony, I will review:

- the vital statistics of the Basin;
- the water quality obligations to Mexico;
- the multiple and complex sources of the Basin's salinity problem;
- the evolution of the Clean Water Act's procedures for setting water quality standards;
- the cooperative efforts of the Basin states in establishing equitable salinity standards; and
- EPA's conclusions on meeting the needs of the people who depend on the Colorado River for water.

My testimony precedes testimony by Peter C. Myers, Chief of the Soil Conservation Service of the Department of Agriculture and Robert N. Broadbent, Commissioner of the Bureau of Reclamation, Department of the Interior. Both Departments work very closely with the seven basin states of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming to select and implement the programs for protecting Basin waters.

## The Basin

The Colorado River Basin covers areas of 42,000 square miles in the United States (approximately one-twelth of our continental land area) and 2,000 square miles in Mexico. The Basin extends 1,400 miles from the Continental Divide in the Rocky Mountains to the Gulf of California.

The Basin itself has a population of about 2.25 million. Through water export projects, it provides either full or supplemental water supplies to more than 15 million people in Southern California, and the Denver, Salt Lake City, Las Vegas, Cheyenne, and Albuquerque areas. With the completion of the Central Arizona Project now underway, the Phoenix and Tucson areas will also be served.

The economy of the Basin is based on irrigated agriculture, mining, forestry, manufacturing, oil and gas production, and tourism. Approximately 2 1/2 million acres are irrigated within the Basin, and well as hundreds of thousands of acres with water exported from the Basin. In Mexico, about one-half million people and 425,000 irrigated acres are served by Colorado River water. The water requirement for development of the Basin's vast oil shale and coal reserves will have great but as yet undetermined impact.

## Water Quality Obligations to the People of Mexico

Minute 242 of the International Boundary and Water Commission defines the U.S. Water Quality Maintenance Obligation to the Mexican people. The Minute provides for a permanent and definitive solution to the international problem of the salinity of the Colorda River.

This agreement states that measures will be taken to assure that the Waters delivered to Mexico measured upstream from the Morelos Dam will have an annual average salinity concentration of no more than 115 ppm (± 30 ppm) total disolved solids greater than the annual average salinity concentration of Colorado River water arriving at Imperial Dam.

Title I of PL 93-320 is the legislation which implements the provisions of Minute 242.

## The Salinity Problem

Due to natural causes, as well as man's activities, the Colorado carries a large dissolved mineral load with salinity concentrations higher than for most other major rivers.

Generally, salinity of the river increases from its headwaters to its mouth. This increase is the result of two basic processes -- salt loading or the addition of salts, and salt concentration caused by reducing the amount of water. Salt loading results from both natural conditions and man's activities. Salt concentration occurs when water is lost through surface evaporation or plant transpiration or when upstream waters with lower salinity are diverted from the Basin.

Studies of the effects of salt loading and salt concentration in the Colorado River Basin have been conducted over the past 20 years. Although this information is not adequate to accurately identify all the contributing sources of salinity, the studies have identified the major sources of salinity.

The first source of salt is the natural pickup of mineral salts by surface runoff and ground water inflow. The headwaters, which make up only a small part of the total Basin, run over weather resistant crystalline rocks with very low solubility; so the runoff from the high mountain area has a lower salinity. The watersheds of the lower elevations are made up of materials generally having a relatively high solubility; so the runoff from these lands has a higher salinity.

Diversions from the Upper Colorado River Basin into surrounding basins occur at or near the headwaters where the river's water has a very low salt content. This removal of high quality water, even though some salt is also removed from the Basin, results in a salt concentrating effect downstream.

As the river runs southward, the concentration of salt is increased by the loss of water to riparian vegetation and to sizeable evaportation from the river water surface and backwater areas. This condition has its greatest impact in the river reach below the Hoover Dam.

Irrigation is the major consumer of water in the Basin and is responsible for the largest man made increases in salinity. Salt is concentrated when water is removed through evaporation and consumption by irrigated crops, but practically all of the dissolved salt is returned to the river. In many areas, return flows from irrigation also leach salts from the banks and underlying geologic formations which adds to the river's salt load.

A 1974 EPA study [1] of major salinity problems resulting from irrigation practices cited the Colorado River Basin as having more salinity problem areas than any other river in the nation. The study reported that nearly 90% of the Colorado's salt load caused by irrigation came from the Upper Basin's 1.6 million acres of irrigated farm land. This acreage, less than 3% of the upper Basin's land area, generated from 24 to 41 percent of the entire Basin's total salt load of 8.15 million tons (as measured at Lee Ferry, Arizona, between 1941 and 1966).

[1] "Evaluation of Salinity Created by Irrigation Return Flows," EPA, Arthur L. Jenke, January, 1974, p. 36-40

The reduction of salt loads through improvements to irrigation practices and systems should be given top priority consideration. For example, one of the most serious salinity sources in the Basin which was identified in EPA's 1974 study is in the Grand Valley area at the confluence of the Gunnison River and the Colorado. Here irrigation waters are being percolated by various paths to a highly saline aquifer and are then being returned to the Colorado due to the abnormally high ground water table caused by excessive irrigation. This cycle is estimated to contribute 704,000 tons of salt to the rivers annually. Thus, Grand Valley's 88,000 irrigated acres (about one-tenth of one percent of the Upper Basin's land area) is contributing 18% of the entire Basin's irrigated agriculture salt load. Programs to improve irrigation practices through reduction of water use and irrigation ditch improvements to stop leakage are obvious methods which could be used to reduce the large salt loads from the Grand Valley.

Reservoir evaporation also contributes to increasing the salt concentration because evaporation removes water while salt load is concentrated in a smaller volume of water. Any use including out-of-basin exports and in-basin uses, which does not return salt to the system reduces overall water volume and effectively increases salinity.

Historically, salt loads contributed by municipal and industrial sources have been minor, totaling about 1 percent of the Basin salt load for the period 1942-61. With the exception of concentrated returns from the Las Vegas, Nevada area most municipal and industrial wastes are relatively low in total salt load.

## The Clean Water Act

To bring the EPA actions on the salinity problem of the Colorado River Basin into focus, a background on the evolution of the Clean Water Act is useful.

The Clean Water Act is the result of more than thirty years of continuing recognition of technological advancements in the field of water pollution control. Prior to the 1972 amendments the States were required to establish water quality standards for interstate streams within their boundaries. The purpose of these standards was to protect and enhance the quality and productivity of the Nation's interstate waters to serve a variety of beneficial uses, such as public water supply, recreation and propagation of aquatic life, and industrial and agricultural water supply uses.

With the passage of the Federal Water Pollution Act Amendments of 1972, technology based controls became the primary tool for meeting water quality criteria. The 1972 amendments continued to cast water quality standards as both a goal setting and regulatory tool.

## The Water Quality Standards Process

A water quality standard defines the water quality goals for all or part of a water body by designating the use or uses to be made of the water and by setting criteria necessary to protect these uses. States adopt water quality standards to protect public health or welfare, to enhance the quality of water and to serve the purposes of the Clean Water Act. To "Serve the purposes of the Act" (as defined in sections 101(a)(2) and 303(c) of the Act) means that water quality standards should, "wherever attainable," provide water quality for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water, taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreation, agricultural and industrial purposes and navigation.

Water quality standards are the foundation of a State's water quality management process. The State water quality management process varies from state to state, and the phrase is used here to describe the general mechanism States use to integrate the various programs under the Act into a coherent management framework.

As part of the water quality management process, States define their water quality goals by setting standards for their waters. They design and implement water quality based pollution control programs to ensure that the standards are attained. Water quality standards guide the development of water quality management plans, serve as the basis for waste load allocations and determine the additional reduction in pollutant loadings necessary to protect or attain uses where technology-based controls are inadequate. Discharge limits are set and permits are issued to ensure that standards are attained. Also, the attainment of water quality standards serves as a benchmark in evaluating the effectiveness of the water pollution control programs.

The process for the adoption of water quality standards by the States begins at the local level. The States develop the standards, which are then reviewed and approved by EPA. To ensure the continuing appropriateness of the standards, the States are required to review them every three years. In addition, the States are encouraged to review the attainability of the standards through the local planning process established under the provisions of the Clean Water Act.

## Colorado River Basin Water Quality Standards

A series of sessions of a "Conference in the Matter of the Pollution of Interstate Water of the Colorado River and its Tributaries" was held during the period of 1966 to 1972. At a seventh session in 1972, the conferees, who were the official representatives of the Basin States, the Departments of Agriculture and Interior and the Environmental Protection Agency, unanimously adopted recommendations pertaining to salinity problems of the Colorado River. The most significant part of their recommendations stated that:

> "A salinity policy be adopted for the Colorado River system that would have as its objective the maintenance of salinity concentrations at or below levels presently found in the lower main stem. In implementing the salinity policy objective for the Colorado River system the salinity problem must be treated as a basinwide problem that needs to be solved to maintain Lower Basin water salinity at or below present levels while the Upper Basin continues to develop its compact-apportioned waters."

As a result of the 1972 amendments to the Clean Water Act, EPA required the States to develop numeric criteria for salinity on the Colorado River. Consequently, in the fall of 1973, EPA submitted to several of the Colorado River Basin States suggestions regarding proposed requirements and procedures for salinity control in the Colorado River Basin, including the establishment of an interstate organization to develop a salinity control plan.

The Basin States, in response to EPA's suggestion regarding the proposed requirements, and in consideration of several other questions that had been generated relative to certain sections of PL 92-500, met in 1973, and among other things formed the "Colorado River Basin Salinity Control Forum."

The Forum is composed of representatives, appointed by the Governors, from the seven Basin States. The mission of the Forum is to provide a Basin-wide coordinated approach to controlling salinity of the River at acceptable levels. Members of the Forum are from the water quality agencies and the water resources agencies of the State governments.

A statement of position for use in discussing the proposed requirements and procedures for salinity control was adopted in 1973. It stated in part that:

> "The States would establish a mechanism for interstate cooperation called the "Colorado River Basin Salinity Control Forum" and that the Forum would prepare semi-annual reports on the development of numeric criteria and the adoption of such criteria by October 18, 1975. The report of the Secretary of the Interior entitled, "Colorado River Water Quality Improvement Program, February 1972" developed under the auspices of the Enforcement Conferences would continue as the most appropriate plan of implementation for salinity control for the Colorado River system. The objective of the plan was the maintenance of salinity at or below levels found in the lower main stem as of April, 1972 while with the Upper Basin States continuing to develop their compact-apportioned waters."

A proposed salinity regulation was published in the Federal Register on June 13, 1974. After hearings in Las Vegas, Nevada, and Denver, Colorado, in August 1974, the final regulation was published on December 18, 1974, in the Federal Register. The regulation sets forth the salinity control policy, procedures and requirements for establishing water quality standards for salinity in the Basin.

The EPA considered the Salinity Control Forum (with members from the seven Colorado River Basin States and representation from the three associated EPA Regions, the Departments of Agriculture and Interior) as the most logical organization for developing a comprehensive salinity control program for the Colorado River Basin. The Forum has developed water quality criteria for salinity based on 1972 levels at three major control points on the River. Below Hoover Dam, 723 mg/l; below Parker Dam, 747 mg/l; and below Imperial Dam, 879 mg/l. These criteria have withstood court challenge by those who have advocated State line salinity criteria (EDF v. Costle, No. 79-2432, CADC).

Water quality standards, including numeric criteria and a plan of implementation for salinity control, were adopted by the seven Forum member States and approved by EPA in 1975. As required by section 303 of the Act, these standards were reviewed and revised in 1978. At that time, the Forum did not recommend changes in the numeric criteria but did recommend a number of Federal and non-Federal measures designed to maintain the adopted salinity criteria. The recommendations of the Forum were adopted by all seven of the member States in their Water Quality

Standards. Colorado adopted the Standards portion but considered the implementation portion to be related more properly to their State planning program. Wyoming adopted the standards with exceptions.[2/]

The Forum began the 1981 review and revision cycle in May of last year. To date, California, Nevada and Arizona have already adopted the revised standards, which did not change any criteria, but did update the plan of implementation. The other States are well into the adoption process.

The basinwide approach to salinity control developed by the Forum relies upon numeric criteria in the lower main stem to protect water quality in the basin. However, this approach is premised upon the basin States acting to collectively accomplish the necessary control measures to maintain salinity at or below the 1972 levels at the critical stations. The adoption by all of the basin States of the Forum's recommended plan of implementation is necessary if the basin-wide approach is to be effective.

[2/] Wyoming exceptions:
a. allow temporary increases in salinity without the necessary conditions proposed by the Forum.
b. use a definition of salinity which is not consistent with the Forum's definition.

## Planned Implementation of the Water Quality Standards

EPA has placed a high priority on salinity control through its Water Quality Management (WQM) program. The Regional EPA Offices have funded significant projects in Wyoming, Utah, Nevada and Colorado that have developed nonpoint source controls. The WQM program has provided data and coordination for discharge permits issued in the Colorado Basin and has provided support to states in developing strategies for focusing their salinity control activities. EPA has also funded, with the states, an Executive Director for the Forum. This grant ends in September 1982 at which time the States have agreed to provide complete support for the Forum's Executive Director.

Individually, the Basin states have developed water quality management plans to conform to the requirements of Section 208 of the Clean Water Act. The water quality management planning process is continuing. As the plans are refined and after such changes have been adopted by the states and approved by EPA, those portions of the plans dealing with salinity control have become part of the implementation plan.

It is important that EPA and the other Federal agencies involved in the effort to correct the Colorado salinity problem recognize and make use of the work of the local, areawide and State WQM agencies. The planning studies prepared by these agencies under sections 208 and 303 of the CWA have shown that many cost-effective measures for salinity and other pollution control are non-structural and low cost. For example, irrigation scheduling has been found to significantly reduce the salinity in irrigation return flows.

The value of non-structural measures and practices has been demonstrated through the Model Implementation Program (MIP), the Rural Clean Water Program (RCWP) and other EPA supported research.

Salt routing studies for salinity projections were made for the 1975 and 1978 Forum reports using a model developed by the U.S. Bureau of Reclamation. This model was also used for projecting future salinity concentrations. For the 1981 review, modifications were made to the procedures used in estimating the amount of salt entering the river system under 1979 (base level) conditions of development. These changes were the result of an analysis of salt tonnages associated with inflow to Lake Powell, ungaged inflow from Lees Ferry to Grand Canyon, gains and losses in Lake Powell and bank storage in Lake Powell. Using the results of these studies, the revised salt load estimate for a flow at Lee Ferry of 14 million acre-feet per year and 1979 conditions is 741,000 tons less than using procedures used for the 1978 review. The Forum believes that the new model inputs are more accurate.

The average salinity concentrations at each of the three lower main stem stations for which numeric criteria have been established have not exceeded the numeric criteria since 1972. Currently, salinity concentrations at the three stations are:

| | Numeric criteria in mg/l | 1980 salinity concentration in mg/l | Salinity concentration below numeric criteria in mg/l |
|---|---|---|---|
| Below Hoover Dam | 723 | 707 | -16 |
| Below Parker Dam | 747 | 703 | -44 |
| Imperial Dam | 879 | 755 1/ | -124 |

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1/ The low salinity concentration for Imperial Dam is the result of excess flows that occurred in 1980.

It is not likely that the numeric criteria will be exceeded during the next 3-year review period. However, because of the extremely long lead time required to conduct salinity studies, complete feasibility reports, authorize and complete construction, and to achieve full impact at lower main stem stations, it is essential to continue efforts to expeditiously implement all feasible salinity control measures.

Summary & Conclusion

Through the technical evaluation and analysis needed for setting water quality standards and in developing a water quality management planning process for the Basin, the salinity problem has been confirmed as a threat to the water supply upon which millions of people in the seven State basin area are dependent. The Colorado River is a practical example of the Clean Water Act at work in responding to a major water quality problem. The Act sets out a process for setting standards and follows through with a way to achieve the standards as well. In this instance the Colorado River is important to all aspects of life in the seven State basin area. The water quality standards for the Colorado River have been developed and accepted by the States through a cooperative public process and have been approved by EPA after a thorough technical review. Through the forum, EPA was able to work very closely with the States in establishing the standards. EPA also supported the development of water quality managemen planning process to achieve and maintain the established standards.

EPA strongly endorses the cooperative Federal/State efforts which have been developed through the WQM planning process to control salinity and other nonpoint source problems in the Basin. The USDA's on-farm programs are among the most cost-effective salinity control programs.

In some instances, implementation of complimentary Department of Interior programs, especially irrigation management, canal or lateral ditch lining, are prerequisite to implementation of USDA's on-farm programs. Therefore, it is critical to closely coordinate Department of Interior activities.

As I stated earlier, representatives of the Departments of Agriculture and Interior will be testifying now on the Federal role in achieving the established water quality standards for this important interstate river basin.

Mr. Chairman, this concludes my prepared statement. I would be happy to respond to any specific question you or the members may have on EPA's findings, concerns and conclusions regarding the Colorado River salinity problem.

Senator **Murkowski**. You indicate basic support of the development of the management planning process to achieve and maintain established standards. Do you support the bill?

Mr. **Eidsness**. I think the EPA supports the general concepts and various portions of the bill, Senator, but we are not in a position to state we unequivocably support this bill at this particular time.

Senator **Murkowski**. The reason for that?

Mr. **Eidsness**. I think our principal concern has been on the extent to which the bill is designed to address the well-defined problem of excessive salt loading in the Colorado Basin.

That has been the basis of our analysis as opposed to the funding, which is the issue you may be thinking of now. But I would be happy to elaborate on certain areas of the bill.

Senator **Murkowski**. I think for the record we would appreciate within a 10-day period if we could get a position from EPA as to the bill as written.

We have had other witnesses testify that they may support the bill with certain changes and amendments. I think it would be helpful if EPA would address specifically their position on the bill; whether they are opposed, neutral or in support or, alternatively, if they feel certain changes should be made.

Do you have any problem with that?

Mr. **Eidsness**. No, sir, I do not. I would be happy to do that during the 10-day period or highlight points now.

Senator **Murkowski**. In the interest of time, since we have an extensive witness list, we would appreciate it if you would submit it in writing.

May I ask you if OMB had any role in the preparation of your position given today?

Mr. **Eidsness**. We consult with OMB.

Senator **Murkowski**. Do they consult with you or you consult with them?

Mr. **Eidsness**. I am not sure who does what to whom, but on a bill of this nature, Senator, which has a Federal exposure in terms of Federal funding down the road, we go to OMB for consultation on these matters, as I think it is appropriate. For the OMB is acting for the President in coordinating views of Federal agencies with respect to these matters.

We don't always see the broader picture in terms of total Federal obligation and funding. I think OMB plays an appropriate role in these particular aspects on bills of this nature, particularly the funding aspects.

I don't feel that the OMB has dictated to EPA at all as to what position we ought to take. You know, the Administrator would be inclined to agree with that.

Senator **Murkowski**. Yes, I know. I would assume your position will be submitted for the record and it will be free of any incumbrances from OMB, when it does come correct?

Mr. **Eidsness**. Yes, sir.

Senator **Murkowski**. Back to Mr. Myers. One more question, and this is with regard to OMB. Would your testimony have been any different or recommendations any different had OMB not been in contact with your Department?

Would you have had a definitive recommendation rather than a nondefinitive at this time?

Mr. MYERS. We probably would have, but I can't specify in what way.

Senator MURKOWSKI. Thank you. I am going to ask the other Government witnesses—and I think it is appropriate to do so—if OMB has played any significant role other than one of the appropriate posture of recommending overall application of what other Government agencies are doing and the necessity of that interchange.

I am interested in any undue pressure brought to bear on any of the professional witnesses for the Federal agencies here, and I am going to individually ask them.

Commissioner Broadbent, did OMB have any role in your testimony?

Commissioner BROADBENT. Yes, sir.

Senator MURKOWSKI. Did it infringe, in your opinion, on your professional obligations as Commissioner of the Bureau of Reclamation to comment free of any undue pressures?

Commissioner BROADBENT. Our testimony would probably have been quite different.

Senator MURKOWSKI. Thank you, Mr. Commissioner. Mr. Friedkin——

Commissioner BROADBENT. I think I should correct that and say I would like to agree with EPA, who said they have to look at the general role of what the posture of this administration is.

As we look at this bill, and what it includes, as it is built, it can be very expensive.

Senator MURKOWSKI. We are all aware of the expenditure. No question. I couldn't be more in tune with the realities of the Federal Government not spending more than it generates in revenue. But I think there is a principle involved here where we need the best recommendations free of pressures that would be brought to bear by these budgeters. I recognize we all have to operate with these agencies and OMB has to provide some discipline, whether it is fiscal discipline or not. I feel obliged to bring out that we are dealing with professional Government agencies that are structured to give recommendations and their obligation is not the same as OMB.

OMB serves a different function, so again, Commissioner, it is my understanding you indicated that your testimony may have been different had you not been required, or had some input from OMB which, I assume, affects the professional attitude or recommendations of your testimony.

Commissioner BROADBENT. Well——

Senator MURKOWSKI. Would you care to clarify specifically?

Commissioner BROADBENT. Basically, I think we feel pretty good about our testimony at this time. We have an administration policy on cost sharing that isn't yet well identified or isn't easily identified and applied.

So that is a considerable concern to us. And I think that would have been the same whether OMB was in it or not. Our testimony went through eight or nine redrafts after consultation back and forth.

I guess I as an individual would feel that there is a better way to do it, but then the system is really governed, as I understand it, by an OMB circular which tells you how you should submit testimony.

Senator **Murkowski**. That is correct. But in your professional opinion and position, do you feel that whether the project is generating a sufficient cost-benefit ratio, is in this case perhaps unduly influenced by OMB?

Commissioner **Broadbent**. Yes, sir.

Senator **Murkowski**. I appreciate that candid answer, and I thank you for that. I think we all have the same concerns here, and we can only turn this thing around, I think, by very candid observations.

I would defer to Mr. Joseph Friedkin. Did you have any input from OMB in your testimony?

Commissioner **Friedkin**. Mr. Chairman, our position from the international aspects, that we concur in and support the concept of the bill, was not materially affected by OMB.

OMB concurred in our support of the concept of the bill. The domestic aspects of it, though, are something for the Interior Department and Department of Agriculture.

Senator **Murkowski**. So your testimony was given totally on the professional opinions of yours and your associates with no undue influence?

Commissioner **Friedkin**. No, sir, no undue influence.

Senator **Murkowski**. Ambassador, I would ask you the same question—whether there was, in your professional opinion, any undue influence or contact with OMB in your testimony.

Ambassador **Crigler**. There was certainly no undue influence, Senator. There was certainly contact, as is required by this circular.

We cleared our testimony with OMB and encountered no serious difficulty in doing so at all, simply due to the fact that we are not involved in domestic considerations that might concern OMB.

Senator **Murkowski**. I appreciate that, Ambassador. I would like to thank you, gentlemen.

I do appreciate your comments, particularly the professionalism of your testimony as presented here this morning.

I think it was extremely worthwhile. I wish you all a good morning. For the next panel, we will call Mr. Jack A. Barnett, executive director, Colorado River Basin Salinity Control Forum, Salt Lake City, Utah; Mr. J. William McDonald, director, Colorado Water Conservation Board, Denver, Colo.; Mr. Myron B. Holburt, chief engineer, Colorado River Board of California, Los Angeles.

And I am going to add to the group by bringing up two panels at once: Mr. Charles L. Boothby, executive secretary, National Association of Conservation Districts in Washington; Mr. Ronald Dudley, irrigation farmer, Uinta Basin, Randlett, Utah, Mr. John Frezieres, president of the Mesa Soil Conservation District and also an irrigation farmer in Grand Junction, Colo.

Is Mr. Frezieres here? He will be in in a minute. Mr. Virgil Jones, manager of the Palo Verde Irrigation District, Blythe, Calif. I gather he is not here, and we have a statement which will be submitted into the record, I believe, forthcoming from Mr. Jones.

And I think we filled up the table. We will start with Jack Barnett. We will proceed with your testimony, and we would appreciate your summarizing it or keeping it to approximately 5 minutes.

## STATEMENT OF JACK A. BARNETT, EXECUTIVE DIRECTOR, COLORADO RIVER BASIN SALINITY CONTROL FORUM, SALT LAKE CITY, UTAH

Mr. Barnett. Thank you, Mr. Chairman. I will do that. Let me express appreciation of the seven Colorado River Basin States for your interest and efforts going into this hearing which we think are a very important matter.

The States have, for almost the last century, been working at establishing with the Congress what has become the law of the river and determine what appropriate apportionment is of the river.

Primarily in the last decade and a half, issues relating to water quality have been addressed by the States, and the agreements that are reflected in the 1974 act are a result of some very carefully constructed decisions that intertwine the water quality and water quantity laws.

Title II of the act is, of course, the concern of the Colorado River Basin Salinity Control Forum, the concerns of the water quality above Imperial Dam.

I believe it should be recognized that it is a truly unique, if not remarkable, alliance that has been put together where seven States and the interests of two nations can be addressed.

The basic agreement is to maintain the water quality standards for the maintenance of salinity levels at the 1972 concentrations at three downstream points.

The use of waters with the salt concentrations that now exist in the Colorado River causes certain predictable economic damage to the citizens that use the water.

Currently, it is estimated that there is approximately $100 million worth of damage in the United States each year caused by the salts in the water, and that each additional milligram per liter of salt that is added will cause an additional half-million dollars in damage.

Therefore, it is clearly not acceptable to proceed without salinity control efforts. There are approximately 10 million tons of salt that reach Lake Mead each year. It has been determined that by the turn of the century 2.8 million tons of salt must be removed or prevented from entering the river annually in order to meet the numeric criteria.

We feel that now after 8 years of working with Public Law 93-320 as it was enacted that we have enough additional information that the law needs to be modified and updated.

Over the course of the last year, the seven Colorado River Basin States met and have identified changes they felt were necessary.

They have advanced proposed legislative changes and are now in unanimous concurrence in support of the legislation that has been introduced.

There is only one minor change that the Forum is asking for in the legislation, and I have identified that in my testimony.

I believe we do not need to go into it because it appears to be editorial in nature. In our judgment, if we do not pass amendments to the act at this time, we will lose valuable time and, further, will not be able to move ahead with some of the more cost-effective salinity control strategies.

We believe that it is appropriate that the four already authorized units be increased to the 10 salinity control units that are identified in the act so that the Department of Interior can move to the more cost-effective opportunities.

We also believe that the Department of Agriculture program offers a very attractive voluntary cost-share program that can lead to some of the most cost-effective salinity control strategies.

Many of the beneficiaries are miles and miles downstream, and we think that the nature of the Department of Agriculture program and its cost-sharing opportunities provide an opportunity for everyone to benefit up and down the river.

With respect to cost sharing, as was authorized in the 1974 act, it is appropriate to characterize the States as being a little bit ahead of their time because they have agreed in that act and continued to agree that 25 percent of the cost of the program will be reimbursed to the Federal Treasury from the two basin power accounts.

Let me digress from my testimony and indicate that that cost-sharing will result in a payback to the Federal Treasury of approximately $125 million over the life of the program.

As is now conceived in the legislation, farmers will also in their cost-sharing programs contribute perhaps as much as $50 million to the program.

And then in addition to that the States, through the funding of the salinity control program, their own in-State salinity control efforts contribute additional dollars.

So I believe you will find on examination that the States have been up front and generous with their cost-sharing opportunities.

Senator MURKOWSKI. I must ask you to kind of wrap up your testimony, please.

Mr. BARNETT. Let me just say in closing that we offer in the short-term cooperation of the States in working with the Congress for this legislation, and in the long term we offer State and Federal partnership in the implementation of this most important water control effort.

Senator MURKOWSKI. Do you recommend the bill as proposed?

Mr. BARNETT. Yes, we do, with that one minor editorial change.

Senator MURKOWSKI. Do you have any comment as to why feasibility wasn't previously established for the four projects that have been authorized?

Was there a Federal or State problem as to why that was deferred?

Mr. BARNETT. I think it relates to timing, the desire to expedite the program when the act was considered in 1974. We are supportive of the administration's decision to not proceed with implementation principles and standards.

We think there are ways the Department of the Interior can expedite their programs so they can bring the program on line faster than the typical program in the past.

[The prepared statement of Mr. Barnett follows:]

Testimony
to
SUBCOMMITTEE ON WATER AND POWER

of the
SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

June 22, 1982

by
Jack A. Barnett, Executive Director
Colorado River Basin Salinity Control Forum

More than 15 million Americans are served in one degree or another by the Colorado River. These are residents of the states of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming. They live in the most arid portion of the United States and rely heavily upon the Colorado River for municipal, industrial, and irrigation water as well as water for hydropower. Additional uses of the Colorado River are made in the Republic of Mexico.

For the major part of the century, the states and their water users have been working with the Congress, the administrative branches of the Federal Government, and the courts to establish what is referred to as the law of the river. Through compact, agreement, treaty, legislation, and litigation, a general understanding has now been reached as to how the waters of the river are apportioned.

Primarily in the last decade and a half issues relating to water quality have been brought to the negotiating tables. The seven Colorado River states have considered their desires and their responsibilities with respect to the salinity of the river and long and important discussions have been held with representatives of the Federal Government and the Congress. The United States has also held deliberations with Mexico and entered into further agreements that relate to salinity. In 1974, the Colorado River Salinity Control Act was carefully constructed by the states and Congress so that water quality matters could be appropriately addressed in the context of the existing law of the river.

Title I of that Act (P.L. 93-320) addresses the salinity control programs that are needed to implement the agreements between the United States and Mexico. Title II of the Act deals with the diversion and use of the waters and the associated salinity concerns in the United States above Imperial Dam. The Congress authorized and directed the Secretary of the Interior to take the lead role with respect to the Federal portion of the salinity control effort. The Act further directs that the Secretary of Agriculture is to work cooperatively with the Secretary of the Interior in searching for ways to control the salinity of the Colorado River. Four salinity control units were authorized by the Congress in 1974 and additional units were identified for further investigation by the Department of the Interior.

The states created the Colorado River Basin Salinity Control Forum so that the seven independent states could come together around a common table and work collectively and cooperatively to find the most effective means for salinity control. The alliances and agreements that have been forged are truly unique and remarkable considering the needs and the responsibilities of two nations and seven states.

The plans agreed to by the seven states and agencies of the Federal Government responsible for water quality called for the maintenance of salinity levels at 1972 concentrations below Hoover Dam, below Parker Dam, and at Imperial Dam while the states continued to develop their compact apportioned water supplies. These levels at the three downstream measuring points are referred to as the numeric criteria. They call for the average annul flow-weighted total dissolved solids concentration to range between 723 mg/L at Hoover Dam to 879 mg/L at Imperial Dam. If salinity control measures were not implemented, it is estimated that the concentrations at Imperial Dam would exceed 1,100 mg/L by the turn of the century.

The use of waters with the salt concentrations that now exist in the Colorado River causes certain predictable economic damage to the citizens that use the water. Currently, it is estimated that there is approximately $100,000,000 of damage in the United States each year caused by the salts in the water in the United States. At the level of concentration that now occurs in the Colorado River, it is further estimated that each additional mg/L of salts that is added to the River will cause an additional half million dollars in damage. The predicted levels of salinity concentration that would occur without salinity control efforts are clearly not acceptable.

There are approximately 10 million tons of salt that reach Lake Mead each year, some from natural causes and some from man induced causes. It has been determined that by the turn of the century 2.8 million tons of salt must be removed or prevented from entering the river annually in order to meet the numeric criteria. The seven Colorado River Basin states, working within the framework of the Colorado River Basin Salinity Control Forum have determined that after eight years of efforts to control salinity under the authorizations of P.L. 93-320, we now have enough additional information so that it is important and timely that the Act be modified and updated.

Over the course of the last year, the seven Colorado River Basin states worked diligently to draft proposed legislative documents to modify the Act and are now in unanimous agreement as to the modifications that need to be made. The seven Colorado River Basin states support S. 2202 as introduced with only one minor requested and suggested change which I will identify at the close of my testimony. The states find it important that the legislation be quickly implemented and therefore strongly urge that this Committee act to report the legislation out of Committee so that it can be authorized before the adjournment of this session. In our judgement, failure to act this year will result in the loss of valuable time and will prevent the expenditure by the Department of the Interior and the Department of Agriculture on salinity control programs in the most cost-effective way.

The legislation would authorize the Secretary of the Interior to spend the funds authorized by the Act in 1974 on 10 salinity control units which would include the four that were originally authorized by the Act. The larger number of salinity control units, based on extensive studies by the Department of the Interior, will allow the Secretary to determine where the funds can be best cost-effectively spent. It is not intended that every component of every one of the units would be constructed and some will be found to be not as cost-effective as others. The bill would not increase the total amount of funds that are authorized to be expended by the Secretary of the Interior.

There has also been proposed in the legislation the creation of a new Department of Agriculture program that will allow the Department of Agriculture to offer to farmers, on a voluntary cost-share basis, a program that will allow for the improvement of irrigation practices. The benefits to the salinity control program, with respect to the return flows from these irrigated lands, are very significant. The beneficiaries of these programs are, to a large degree, many miles downstream. It has been determined over the last eight years that some of the most cost-effective salinity control strategies are now available within technologies that the Department of Agriculture can best advance through these onfarm improved agricultural practices. The legislation would authorize the Department of Agriculture to create a new program, write rules and regulations that will be specially tailored to the needs of the salinity control programs of the Colorado River and spend, through this decade, $194,300,000 in these cooperative cost-sharing ventures.

The salinity control program, as authorized in 1974, can be viewed as being a little ahead of its time with respect to cost-sharing. The 1974 Act and the legislation before you today provides for pay-back of Federal expenses in the amount of 25% from the two Basin power accounts. These funds are raised by increased power charges, from the citizens of the seven Colorado River Basin states, to reduce Federal salinity costs. This significant 25% cost-sharing would be continued by this legislation in the Department of the Interior program and would be newly authorized in the Department of Agriculture program. We have been advised by the Western Area Power Administration that for this pay-back to occur, power rates in the Upper Basin will need to be increased by only the small amount of .012 mills per kilowatt hour. We do not anticipate there will need to be an increase in power rates in the Lower Basin since Nevada and California have agreed to subjugate their use of power revenue to the salinity control program.

The states are committed to this significant cost-sharing with potentially tens of millions of dollars being paid back to the Federal Treasury from the Basin accounts. Therefore, the states are concerned, as a financial partner with the Federal Government, about the cost-effectiveness of the program. We fully support the concepts in the legislation which require that before salinity control units are constructed they are evaluated to determine if they are among the most cost-effective alternatives that current technology and information available will allow us to consider. The legislation gives the Congress and the states an opportunity to review the findings of the Administration before salinity control units are built.

The Forum only requests one minor change to the Bill as introduced. We would ask that the entire Section 12 of S. 2202 be removed. That section would strike a sentence in the original Act. The removal of that sentence does not appear to be needed and we suspect that it must have originated from a drafting error.

In behalf of the seven Colorado River Basin states, I want to thank this Committee for the attention that it is giving to this most important legislation. In the short term, we offer the cooperation and support of the Forum, its staff, and the seven Colorado River Basin states to assist the Congress as it considers this legislation. In the long term, we offer a state/federal partnership in the implementation of this most important water quality control effort.

Senator MURKOWSKI. Thank you, Mr. Barnett.

We will move on to Mr. J. William McDonald, director of the Colorado Water Conservation Board. Mr. McDonald, we welcome your testimony.

## STATEMENT OF J. WILLIAM McDONALD, DIRECTOR, COLORADO WATER CONSERVATION BOARD, DENVER, COLO.

Mr. McDONALD. Thank you, Mr. Chairman. My name is Bill McDonald. I am testifying today on behalf of Colorado. I am submitting a statement, and I will simply summarize.

Senator MURKOWSKI. Please proceed.

Mr. McDONALD. Thank you. In recognition of the Federal role and responsibility for a water quality problem, which several witnesses have indicated has been international and interstate implications, Congress passed the Colorado River Basin Salinity Control Act.

What Senate bill 2202 is doing is bringing refinements to that program, as we have learned more about it in the last few years.

What I would like to speak to briefly is the particular interest that Colorado has in the legislation pending before you today.

Those interests are essentially twofold; first, we are working together with the other States and the Federal Government to address the salinity problem through the agreed-upon basinwide approach, while each of us continues to develop our compact apportioned waters.

Second, and more importantly so far as my personal testimony is concerned today, I want to emphasize that Colorado is the State in which perhaps the majority of the salinity control program is carried out.

We are the State, first of all, in which three of the six newly authorized and two of the already authorized projects would be located.

We are, second, the State where a large portion of the USDA's onfarm program would be carried out. We, third, are the State in which probably the larger portion of the lands managed by the Bureau of Land Management are located and, fourth, we are the State in which some of the largest saline water could be potentially put to good use.

In light of that large activity in Colorado, not only the State but local water users have taken an interest in the program and in this bill especially.

I can report to you their general support for the legislation, although there are certain details yet to be resolved on specific projects and programs in Colorado.

What I would like to emphasize is we anticipate those details can be worked out to mutual satisfaction of all, especially if the legislation is passed which provides a framework for the resolution of the remaining details.

I give briefly two examples: the onfarm program has to date been implemented under statutory authorities that have not been tailored to the salinity control program.

One of the key features of S. 2202 is to authorize the onfarm component of the program within a statutory framework which would provide a means of ironing out the details.

Another example is the incidental wildlife values. The 1974 act did not give authority to the Bureau of Reclamation to implement such measures.

This has led to some misunderstanding among interested parties and agencies as to what could and should be done. S. 2202 would clarify the matter and provide the basis for resolving such issues in the future.

In summary, Colorado supports the passage of S. 2202 with the minor reservations with respect to the editorial change that Mr. Barnett has spoken to.

Senator MURKOWSKI. Thank you.

[The prepared statement of Mr. McDonald follows:]

STATEMENT OF J. WILLIAM McDONALD, DIRECTOR
COLORADO WATER CONSERVATION BOARD

BEFORE THE

SUBCOMMITTEE ON WATER AND POWER
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

CONCERNING S. 2202

Washington, D.C.
June 22, 1982

## Introduction

My name is J. William McDonald. I am testifying today on behalf of Colorado's representatives to the Colorado River Basin Salinity Control Forum: Mr. Monte Pascoe, Executive Director of the Colorado Department of Natural Resources; Dr. Robert Arnott, Assistant Director of the Colorado Department of Health; and Mr. David Robbins, former Colorado Deputy Attorney General now in private practice in Denver, Colorado. In my capacity as Director of the Colorado Water Conservation Board, I am Mr. Pascoe's alternate to the Forum and one of Colorado's representatives to the Forum's work group.

## Summary of Statement

Colorado favors enactment of S. 2202, a bill concerning amendments to the Colorado River Basin Salinity Control Act of 1974 (P.L. 93-320). The program authorized by Title II of the Act is an integral component of the effort to control the salinity of the Colorado River. It is important that this program now be updated and expanded to reflect the information and understanding gained since the passage of the Act.

We recommend only one minor change to the bill as introduced. Paragraph (12) of Section 1 of the bill would strike a sentence from the original Act. This seems to be a drafting error which needs to be corrected by deleting paragraph (12) from the bill.

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Testimony

Following the passage of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500), the seven states of the Colorado River Basin organized the Colorado River Basin Salinity Control Forum (hereinafter referred to as the Forum) for the purpose of fostering a coordinated, basin-wide approach to the salinity problem in the Colorado River system. The objective of this coordinated, basin-wide approach is the maintenance of salinity in the lower mainstem of the Colorado River at the concentrations occurring in 1972 (expressed as numeric criteria) while the states continue to develop their compact apportioned waters. In order to maintain the numeric salinity criteria in the lower mainstem which have been adopted by the states and approved by the Environmental Protection Agency, it has been estimated that about 2.8 million tons of the approximately 10 million tons of salt which now enter the river on an average annual basis will need to be removed by the turn of the century.

In recognition of the federal role in and responsibility for a water quality problem which has both interstate and international dimensions, Congress passed the Colorado River Basin Salinity Control Act (P.L. 93-320) in 1974. That Act consists of two titles. Title I addresses the water quality programs which are needed to fulfill agreements between the United States and Mexico. Title II of the Act deals with those measures upstream of Imperial Dam which will reduce salt loading to the river.

Since the passage of the Act in 1974, eight years of experience has been gained with the completion of several planning studies, the acquisition of considerable base-line data, and the initiation of two of the salinity control projects originally authorized by the Act. Based upon this experience, it has become evident that Title II of the Act needs to be updated and expanded to reflect the newer information and greater understanding which we now have. S. 2202 does just that.

S. 2202 would make four main amendments to Title II of the Act:

(1) Six new salinity control projects would be authorized for construction by the Department of the Interior, including joint ventures with non-federal entities to demonstrate saline water use technologies,

(2) The Department of Agriculture would be authorized to implement a voluntary cooperative program of technical and cost-sharing assistance for private land owners in order to improve on-farm water management practices,

(3) The Bureau of Land Management, Department of the Interior, would be authorized to develop a program to minimize salt loading from lands which it manages, and

(4) There would be miscellaneous changes to various provisions of Title II, which changes are needed to clarifiy the authorities and procedures for the execution of the salinity control program.

Colorado has a major interest in S. 2202. First, we are working together with the other states and the federal government to address the salinity problem through the agreed upon basin-wide approach while we continue to develop our compact apportioned waters. Secondly, Colorado is the state in which: (1) three of the six newly authorized and two of the already authorized projects are located, (2) a large portion of the Department of Agriculture on-farm program will be carried out, (3) much of the land in the basin which is under the jurisdiction of the Bureau of Land Management is located, and (4) some of the larger sources of saline water for industrial use are found.

In light of the fact that a very large portion of the salinity control program occurs in Colorado, local water users have taken a particular interest in the provisions of S. 2202. I can report to you their general support for this legislation, although there are certain details yet to be resolved on the specific projects and programs in Colorado. However, we anticipate that these details can be worked out to the mutual satisfaction of all involved.

Indeed, this legislation is needed in order that these matters can be resolved. For example, the on-farm program carried out to date in the Grand Valley in Colorado has proceeded on the basis of existing authorities not tailored to the needs of the salinity control program. S. 2202 would specifically authorize the on-farm component of the salinity control program, thereby providing a statutory framework within which to solve previously encountered problems.

Another example is the provision which S. 2202 makes for the replacement of incidental wildlife values. The 1974 Act did not give authority to the Bureau of Reclamation to implement replacement measures when constructing salinity control units. This has led to some misunderstanding among interested parties and agencies as to what could and should be done. S. 2202 clarifies this matter and will provide the basis for resolving such issues in the future.

In summary, Colorado supports the passage of S. 2202. We urge your expeditious action in reporting this bill favorably to the full committee with the one requested change.

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Senator MURKOWSKI. I have a question concerning the judgment of the representatives of the Federal Government in performing the task, over the past, I guess, 7 or 8 years, with respect to the salinity control program.

Have you assessed that satisfactorily?

Mr. McDONALD. You are asking for my assessment?

Senator MURKOWSKI. Yes.

Mr. McDONALD. I would think all seven Colorado River Basin States, at least in the first 5 or 6 years of the program, were not entirely satisfied with the progress that was being made in the Bureau of Reclamation program.

I think it would be fair to say, at least from Colorado's perspective if not also from the perspective of the other six States, that since about 1979 when a significant amount of internal revision to the program scheduling and planning was accomplished by the Bureau, the Bureau has, with a couple of minor exceptions, proceeded on schedule since 1979 and I think in a manner that has been quite satisfactory.

Senator MURKOWSKI. Thank you, Mr. McDonald. The next witness is Mr. Myron B. Holburt, chief engineer, Colorado River Board of California.

## STATEMENT OF MYRON B. HOLBURT, CHIEF ENGINEER, COLORADO RIVER BOARD OF CALIFORNIA, LOS ANGELES, CALIF.

Mr. HOLBURT. Thank you. I have a statement to submit. I also have a prepared statement to submit for Mr. Virgil Jones, who cannot be present today.

Senator MURKOWSKI. It will be welcomed and included in the record.

Mr. HOLBURT. I am here today on behalf of the State of California. We support Senate bill 2202. We also support the statement you heard by Jack Barnett, executive director of the Colorado River Basin Salinity Control Forum.

My statement, briefly, will cover the impact of salinity in California and will have similar impacts on the States of Arizona and Nevada.

Essentially, California is the State that takes the bulk of the detriments due to salinity. We do it now and would have to take it in the future if the salinity detriments continue.

Because of this, we have been very active in promoting the salinity control program, standards program, as well as all other activities relating to that.

Currently, southern California receives about 65 percent of its total water supply from the Colorado River, which provides a supplemental supply for 12 million people in the south coastal basin of southern California and about 800,000 irrigated acres.

We expect not only that we will pay our share, but in terms of the power rates that would have to be added to the Hoover and Parker-Davis projects, we will be paying the bulk of those costs.

As far as the impact on us with respect to the urban areas, it attacks us in a wide variety of ways. In addition to the program, there are many steps that have been taken to ameliorate these programs.

Mr. David Kennedy will go into that part a little further. With respect to agriculture, there are a number of activities that have also been taken to ameliorate the conditions. The putting in of drainage tile programs have all been done with respect to trying to adjust to the salinity program and the problems it creates.

However, there is no question that we cannot do this alone, that we need the salinity control program to prevent the salt from entering the river.

And that is the basic reason that we support this bill. Thank you, Mr. Chairman.

[The prepared statements of Mr. Holburt and Mr. Jones follow:]

### Statement of Myron B. Holburt, Chief Engineer
### Colorado River Board of California
### in Support of Senate Bill S. 2202*

I am pleased to have the opportunity to submit to the Committee a statement in support of S. 2202. I also want to express support for the statement submitted to the Committee by Jack Barnett, Executive Director of the Colorado River Basin Salinity Control Forum on behalf of the seven-state Forum. My statement will primarily focus on the impact of Colorado River salinity on California.

The Colorado River Board of California is a strong supporter of the federal government's Colorado River Salinity Control Program, and helped establish the Forum to work for implementation of a basin-wide salinity control program. I have been one of California's representatives on the Forum since it was established in 1973.

Two of the salinity control units authorized by P.L. 93-320 in 1974 (Colorado River Basin Salinity Control Act) are under construction. Other units identified in P.L. 93-320 have been shown to be cost-effective and S. 2202 accomplishes the purposes of P.L. 93-320 by authorizing them for construction. Additional funding is not requested beyond that authorized in 1974 for projects to be constructed by the Department of Interior. The proposed legislation allows the Secretary of Interior to use presently authorized funds to construct the most cost-effective components of the units.

Over the past several years, it has become clear that the on-farm water management programs of the Department of Agriculture are among the most cost-effective means of salinity control. Senate

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*Presented before the Subcommittee on Water and Power of the Senate Committee on Energy and Natural Resources, June 22, 1982

Bill S. 2202 establishes a new Department of Agriculture program of voluntary cost-share onfarm water management for salinity control.

The salinity of the Colorado River is a matter of great concern to California. Southern California receives about 65 percent of its total water supplies from the Colorado River, which provides a full water supply to about 800,000 irrigated acres and a full or supplemental supply to about 12 million people. Because of California's location at the lower end of the Colorado River Basin, the water that it diverts contains all of the dissolved salts that have entered the water upstream.

At Parker Dam, where diversions are made for service to a large urban area on the coastal plain of Southern California and to the Central Arizona Project, the salt concentration is about 725 milligrams per liter (mg/l). This is forty percent greater than the 500 mg/l that has been recommended as the maximum secondary contaminant level for salinity for domestic purposes by the U. S. Public Health Service. At Imperial Dam, where most of California's and Arizona's agricultural water is diverted, salinity is about 825 mg/l. This water supply is classified as a high salinity water for irrigated agricultural use by the United States Salinity Laboratory of the Department of Agriculture.

The detrimental impacts of salinity on users of Colorado River water were determined by the Bureau of Reclamation and reported in "Colorado River Salinity - Economic Impacts on Agricultural, Municipal, and Industrial Users", dated December 1980. This report summarizes the results of earlier studies funded partially by the

Bureau of Reclamation, which are the most comprehensive yet undertaken of economic impacts of salinity. Even so, the study does not cover all detriments experienced by water users, omitting, for example, some of the detrimental impacts on industrial users. Because of these omissions and the additional detriments experienced in local areas described later in this statement, I believe that the cost to users is even greater than is set forth in the Bureau's report.

In this statement, I will briefly describe the ways that Southern California urban and agricultural users of Colorado River water have been adversely affected by high salinity Colorado River water, and what they have done to alleviate some of these effects. The impacts experienced by California's urban and agricultural users are also being felt by our neighboring states of Arizona and Nevada.

Additional information on the importance of salinity control will be presented by David Kennedy, Assistant General Manager of The Metropolitan Water District of Southern California and Virgil Jones, Manager, Palo Verde Irrigation District.

## Salinity Impacts on Urban Areas

The harmful economic impacts on urban water users caused by using Colorado River water, which is both a high salinity water and has a high hardness, are:

1. Reductions in the useful lives of: (a) water utility distribution facilities; (b) home, business, and industry piping and fixtures; (c) water using devices within homes, business, and industries; and (d) home and industry heating vessels.

2. Increases in water treatment and conditioning costs.

3. Increases in the use of bottled water because of objectionable taste characteristics.

4. Damages to ornamental shrubs and plants requiring early replacement.

Some of these impacts are experienced as current expenses, but most are experienced as decreased service lives of the affected facilities and are thereby probably overlooked by many domestic and commercial water users. In addition to these costs, substantial economic detriments result from the reduced reuse possibilities of high salinity water and problems associated with its use in areas that rely on ground water basins as well as on surface water deliveries for their water supplies. Most of the water delivered to urban communities is not consumptively used but ends up as either sewage effluent or underground percolating waters. These waters, if not too saline, would normally be available for reuse. However, if the water supply has a high salinity, reuse options are precluded, with the only treatment alternative that would permit any reuse being desalting, which is far too costly.

It is difficult to develop a dollar value for these impacts but it is evident that they do represent economic detriments to the use of high salinity water.

## Areas Using Colorado River Water

The Southern California metropolitan area presently receiving Colorado River water is one of the major population centers of the nation. This region had a 1980 population of about 12 million, and the Metropolitan Water District of Southern California serves this area with both Colorado River water and water from northern California. In 1980, Metropolitan imported 820,000 acre-feet from the Colorado River and 560,000 acre-feet from the California State Water Project to serve its area. The area overlies groundwater basins containing vast alluvial aquifers which are relied upon as a water source for about a third of the area's total water requirements.

In the desert region of California, Colorado River water constitutes the only source of supply for about 100,000 persons residing in Imperial Valley and along the Colorado River from Needles on the north to the Mexican Border.

## Measures to Reduce Impact of Colorado River Salinity

Both individual water users and water distributing entities have adopted measures that reduce to some extent the harmful impacts of high salinity water. Metropolitan has been blending its more costly water supplies from northern California, with a salinity of about 250 mg/l of dissolved solids, with its Colorado River water to reduce the water salinity to a blended quality of about 500 mg/l. Several hundred thousand water users, both domestic and commercial, have installed individual water softeners on their plumbing facilities. The use of bottled water is widespread. Individuals have attempted to reduce the impact of corrosion of plumbing facilities by installing premium materials for vulnerable facilities, for example, copper, rather than galvanized iron pipes, and high-grade copper alloys to lessen the effects of the dezincification of less costly copper alloy fixtures.

State water quality control agencies have established salinity standards for waste discharges in subbasins of the Santa Ana River Valley, a major inland valley in coastal Southern California, which severely limits the use of Colorado River water in those basins. Waste discharges in the upper basins both percolate into the groundwater aquifers and are available for reuse and flow as a surface stream to lower basins for reuse. The water quality control agencies have also adopted plans for the basins, pursuant to Section 208 of the federal Clean Water Act that set objectives for groundwater quality that severely restricts the use of Colorado River water.

## Salinity Impact on Urban Areas

The above-described detriments result in additional water costs incurred by the urban user of Colorado River water, and the major portion of the detriments are quantified in the December 1980 Bureau of Reclamation report. However, the report does not include some detriments such as the loss of the potential for reuse of water.

The cost to California urban users is many tens of millions a year. While the costs of replacements of plumbing lines and fixtures is included in the total economic impacts, these dollar values do not reflect the personal dollar impact on the individual who must replace plumbing as a result of high salinity water. This impact may be seen in a personal experience. One of our staff members had to replace a nine-year-old water piping system in the family's home because corrosion apparently caused by the use of Colorado River water resulted in numerous leaks in the home's pipes.

the cost of $2,200 to replace nine-year-old pipes demonstrates the economic hardship on individual homeowners in Southern California metropolitan area resulting from high salinity.

## Salinity Impacts on Agricultural Areas

Colorado River water, classified as high salinity water, requires special management in its use so that the crop yields may be maintained and low-salt tolerant plants will not be damaged or killed. The key aspect is controlling the total salt concentration of the soil-water solution in contact with the germinating seeds, and, later, the plant's roots. The predominant factor restricting plant growth is the total salt concentration of the soil-water solution. When the applied water is of a high salinity and the soils are such that it is difficult to maintain the soil-water solution at a low salt concentration, high value crops with a low salt tolerance cannot be grown.

Sufficient water must be applied to meet the consumptive use requirement for each crop as well as enough extra water for conveying, or leaching, salts down through the root zone to control salinity. This extra water is called the leaching requirement. In most of the California areas receiving Colorado River water, correct management practices require underground drainage pipes to remove the highly saline soil-water solutions where the soils lack adequate natural drainage to carry away the leaching water.

Additional management practices that must be implemented, depending upon soil, crop and salinity of the applied water, include precision land levelling, special irrigation practices, and choosing crops with high salt tolerances.

## Areas Using Colorado River Water

Colorado River water is used in irrigating about 800,000 acres in California on which many specialized high-valued crops are grown such as avocados, dates, citrus, grapes, and winter vegetables, as well as basic crops such as cotton, alfalfa, wheat, and sugar beets. Most of these lands are located in the inland desert region of Southern California in Imperial, Coachella, Palo Verde, and Yuma Valleys and the balance, about 40,000 acres, are located on the coastal plain served by the Metropolitan Water District of Southern California. Imperial and Coachella Valleys lie southerly and northerly, respectively, of the Salton Sea, and the Palo Verde and Yuma Valleys lie along the Colorado River.

## Measures to Reduce Impact of Colorado River Salinity

Farmers using Colorado River water apply various management practices to continue the beneficial use of the high salinity water. Some practices are applied by individual farmers while others are implemented by the irrigation districts providing water service to an area. Irrigation districts have installed master networks of deep ditches, or drains, and have supported the efforts of the farmers to install pipe drains under their lands that discharge into the master drains.

Other management measures have been adopted by farmers as required by their individual circumstances in coping with the high salinity of the Colorado River water. Measures that have been implemented include the precise laser levelling of farms to enable flood, rather than furrow, irrigation to be practiced. Flood irrigation on the precisely levelled lands provide uniform water penetration and efficiently transports dissolved salts in the soil-water solution below the root zone to the drainage system with a minimum of applied water. Where land levelling is impractical, sprinklers have been installed to develop the same effect. In both cases, irrigation must be scheduled with smaller quantities of water at each irrigation and at more frequent intervals to maintain a downward movement of salts.

These management practices require the expenditure of substantial sums of money, with expenditures of about $500 per acre for a sprinkler irrigation set-up and about $50 to $100 per acre or more for precision land levelling. As many farmers may not have access to the capital necessary for such practices, they may be forced to change to more salt tolerant crops that yield a lower income.

The three major public agencies serving Colorado River water in the desert portion of California are Imperial Irrigation District, Coachella Valley Water District, and Palo Verde Irrigation District. All of these agencies have supported and are continuing measures to enable their farmers to make beneficial use of Colorado River water. The measures undertaken by Imperial Irrigation District and its farmers are illustrative of the measures required to handle high salinity water on fine textured soil.

Imperial Valley soils are predominately fine textured, with high percentages of clays and silts. These soils do not drain well, and the valley farmers found out early that, even with the construction of deep channels as open drains, there was insufficient lateral movement of water through the soils to these open drainage ditches for their lands to be kept free from salt buildup. In 1929, some farmers began the installation of underground pipe drainage systems below their fields to obtain positive drainage flows.

Encouraged by the success of these early installations, the District has aggressively encouraged farmers to install and maintain pipe drainage networks under their lands. Through 1980, a total of over 27,000 miles of underground drainage pipes have been installed by local farmers, which drain into the surface drainage ditches maintained by the District. These underground drainage pipes have cost over $70 million. Underground drainage lines must be cleaned of accumulated deposits and incrustations at two to five-year intervals, at a cost of about $600 per mile of pipe.

The Imperial Irrigation District has also been lining its laterals with concrete to decrease the seepage of irrigation water into the soil and thereby reduce the drainage problem. Private landowners have been lining their farm ditches with the same objective. Through 1980, 759 miles of District laterals have been concrete lined at a cost in excess of $20 million, and 2,276 miles of private farm ditches have been lined at a cost of nearly $29 million.

In addition to these costs, farmers in Imperial Valley have spent large sums on other measures to enable the continued growing of high- value crops with Colorado River water. These measures have included all of those mentioned earlier, and, in addition, a measure to assure the germination of seeds by moving portable sprinkler systems onto fields and using the portable system for the initial germination and commencement of growth of the plant. After the plants are established, the sprinkler systems are removed and the balance of the irrigation requirements are met by furrow or flood irrigation processes.

### Salinity Impact on Agricultural Areas

The components of the economic detriments to irrigators in using Colorado River water of high salinity are numerous and difficult to determine with accuracy. The studies summarized in the Bureau of Reclamation's 1980 report have been designed to develop a measure of the costs experienced by all irrigators in the study areas using Colorado River water. The studies are based on the assumption that each irrigator would undertake those measures that would optimize his return, either by going to lower valued crops, or by taking other measures previously discussed that would assist him in maintaining productivity as long as practicable. California's farmers are combatting the Colorado River's salinity by incurring direct expenses such as installing underground drainage pipes, lining canals and laterals, levelling lands and installing sprinkler systems, all with the goal of being able to continue to use their high salinity water supplies. These measures also increase operating costs, since: (1) more farm labor is required to operate more precise irrigation methods, (2) additional water must be purchased for leaching salts, (3) added fertilizer must be purchased and applied because of the increases in applied water, and (4) underground drainage pipes must be maintained.

## Summary and Conclusion

The detrimental salinity impacts on California users of

Colorado River water are both demonstrable and of substantial magnitude. The current cost to California's Colorado River water users is at least many tens of millions of dollars a year and will increase significantly unless the additional salinity control units identified and the extensive onfarm salinity control measures to be authorized by S. 2202 are implemented. The Colorado River Board of California strongly urges the passage of S. 2202.

## Statement of Virgil Jones, Manager,
## Palo Verde Irrigation District,
## in Support of
## Senate Bill S. 2202*

My name is Virgil Jones. I am the manager of the Palo Verde Irrigation District in California and a farmer in that District. I have had farming interests in both Palo Verde and Imperial Valleys and am thoroughly familiar with the Lower Colorado River Basin's agricultural problems and concerns. In addition, I am an appointed member of the Colorado River Board of California.

Palo Verde Irrigation District is in eastern Riverside County along the western bank of the Colorado River. The District includes 120,500 acres of which 97,000 acres are under cultivation. The District has one of the oldest diversion rights on the entire river system, dating back to 1877. Expenditures for the District's Colorado River water facilities by the District and its predecessors amount to about $30 million. The principal agricultural products of the Palo Verde area are alfalfa, wheat, cotton, lettuce, cantaloupes, watermelons, onions and citrus with a combined crop value of $90 million. Livestock operations amount to an additional $28 million.

As a farmer, I have participated in the implementation of onfarm water management measures of the type proposed by this legislation and can tell you that these practices are a cost effective means for improved water management and salinity control.

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*Presented before the Subcommittee on Water and Power of the Senate Committee on Energy and Natural Resources, June 22, 1982.

We in the Lower Colorado River Basin have seen the impact of increasing salinity in our water supply. As salinity of the river increases, it requires additional irrigation water to leach the salt from the soil thus reducing the efficient use of our water supply. Further, increased salinity reduces the productivity of the land giving smaller yields per acre or forcing a shift to less profitable salt tolerant crops. These salt tolerant crops are already in overproduction and are in surplus in the agricultural marketplace.

The nation enjoys the many specialized crops, especially winter vegetables grown through irrigated agriculture within the Lower Colorado River Basin. In order to continue to provide the nation with these low cost food stuffs, the ever increasing salinity of the River must be controlled. The present level of salt in the Colorado River, although not as low as we would desire, is manageable. However, further increases in salinity will result in significant detriments to agricultural users in the Lower Basin.

The District and the agricultural community are committed to significant cost sharing for this vital onfarm program. Not only are individual farmers paying 25 percent of the cost of the onfarm measures but 25 percent of the federal contribution would be reimbursed from the Basin development funds under the proposed legislation.

Senate Bill S. 2202, together with P.L. 93-320, offers a Basinwide cost effective and efficient program to control the increasing salinity of the Colorado River. I support the statements submitted to the Committee by Jack Barnett, Executive Director of the Colorado River Basin Salinity Control Forum, and Myron B. Holburt, Chief Engineer of the Colorado River Board of California and I, on behalf of farmers in the Palo Verde Valley and in the Lower Basin, urge the passage of S. 2202.

On behalf of the Palo Verde Irrigation District, I thank you for the opportunity to present this statement.

Senator MURKOWSKI. Mr. Brown tells me that you have been around a good deal and are quite knowledgeable. Have you been following this since 1974 or thereabouts?

Mr. HOLBURT. Earlier than that.

Senator MURKOWSKI. Does it seem that we have got kind of an unusual situation where on one hand we have a critical problem with our "good neighbor policy" and, on the other, we are 10 years into this and we have four authorized projects that are not complete with costs in excess of $300 million yet to be funded and we are now talking about six more?

Obviously, when they go on line, and assuming they work and there is enough money available they could resolve some of the major concerns over salinity. But how do we get this thing functioning more expeditiously in relationship to the priority regarding our relationship with Mexico?

Mr. HOLBURT. Well, I think one of the reasons that we introduced the six new projects without feasibility studies based on status reports was an attempt to move ahead faster.

The whole feasibility process of the Federal Government is very slow, and to accelerate the process, that was one of the reasons in this bill we did that.

We did it on the basis of a status report. Also, it is quite apparent that the programs of the Department of Agriculture are very cost effective, more cost effective than some of the Interior programs, and they can be done a lot quicker by working with local farmers.

And we felt it important that this program get moving with specific direction to the Department of Agriculture.

Senator MURKOWSKI. I assume that you feel that you and certainly other members of the panel who preceded you on your panel have the type of relationship with the Federal agencies that allows them to call on your expertise and experience in these areas, thereby better able to come up with recommendations on the feasibility studies.

Mr. HOLBURT. Yes, we work very closely, myself and members of my staff.

Senator MURKOWSKI. You have been watching the Government work for a long time. Do you see any change in the role that OMB has on behalf of Government witnesses?

Do you feel this has changed in any way the freedom of the professional Government witness to express his professional opinion? Is this something new? I ask you this in relationship to your experience testifying before Government agencies or various Senate or House committees.

Mr. HOLBURT. Well, my understanding is that it has always been there. I guess there is always a change, to a degree, depending upon the administration and the personalities of the Director of the OMB and his assistants and how they interact with the Cabinet officers and their supporters.

Senator MURKOWSKI. Sometimes it is a little difficult. I have had opportunities of late to note testimony that had been anticipated at various hearings and then the witnesses have advised us that they could not testify regarding the legislation.

If they were to testify, they would testify against the legislation. I am sure you would agree that that is not in the best interest of an agency in relationship to the responsibility in the strictest professional application of their duty.

Mr. **Holburt**. I really appreciate your comments. It is the first time I have heard a Senator dig into this relationship as you have this morning.

I agree with what you are saying: people should be able to express their professional views and then the policy decision of the administration should be a separate issue.

Senator **Murkowski**. I thank you for your testimony this morning. We will proceed with Mr. Charles L. Boothby, executive secretary of the National Association of Conservation Districts.

## STATEMENT OF CHARLES L. BOOTHBY, EXECUTIVE SECRETARY, NATIONAL ASSOCIATION OF CONSERVATION DISTRICTS

Mr. **Boothby**. Thank you. We represent the 2,950 conservation districts in the 50 States, Puerto Rico, and the Virgin Islands, and the 17,000 conservation district officials which serve on the local boards.

I must say it is a real pleasure for me to be at this table with two of my local bosses who are sitting to my left.

Our association is dedicated to encouraging the adoption of conservation methods of farming to protect the long-term productivity of the land.

We believe special concern is needed for the future of the irrigated lands of the Western United States, because of their particular problems, and also because of their significant contribution to the national agricultural industry.

Conservation districts have been supportive of salinity control efforts through onfarm water management practices for many years.

This work is both effective and cost efficient. We think the work that has been carried out under Public Law 93-320, the Colorado River Basin Salinity Control Act of 1974, has been a good example.

This work has been supplemented by the targeting of funds within the agricultural conservation program, the conservation operations program of SCS, and ARS research.

One of the main features of these projects has been the search for an institutional arrangement that would facilitate rapid acceptance of new irrigation systems and techniques by farmers.

This has involved the active participation of the local conservation districts. Based on this experience, we support passage of S. 2202. We think there are some minor amendments that could strengthen the bill and make it more effective, and we have included them for your consideration.

We support exempting salinity control programs from the principles and standards or any subsequent replacenent guidelines.

Salinity control programs are primarily water quality control prograns, not water resource development projects, and can ill afford the additional costs created by the extensive planning and review processes invoked by past principles and standards.

The success of conservation programs conducted through long-term contracts with private landowners and operators has been proven.

Further, separating the program out from the Agricultural Conservation program would eliminate the present $3,500 per farm payment limitation that has limited the usefulness of the ACP in salinity control.

We would offer two amendments to the bill which are primarily technical amendments: The first would ask that this program will be developed and implemented in cooperation with soil and water conservation districts established under State statutes and/or tribal laws wherever such lands are included within the boundaries of soil and water conservation districts.

This amendment would assure that the type of administrative structure proven so effective in past work would be an integral part of this new program.

Also, we are suggesting that the Secretary of Agriculture may utilize grants or cooperative agreements with conservation districts, local governmental agencies, colleges or universities, or others as appropriate to carry out the activities identified in subsection 202(c)(2).

This amendment would prevent problems whereby Federal personnel ceilings might preclude implementation of the onfarm program unless personnel are diverted from other areas of the country.

This proposed provision would give USDA an alternative in management that we feel is more acceptable than adding more Federal personnel to the payroll.

Mr. Chairman, we commend the committee on its concerns with the serious problems facing irrigated agriculture in the semiarid and arid regions of the country.

We are also pleased that you recognize this as a problem which must be solved at the local level through a specific program effort.

The Nation faces many serious conservation problems today, led by a growing soil erosion problem on our rainfed croplands, and an impending Dust Bowl caused by the plow out of marginal lands in the Great Plains.

The traditional soil and water conservation programs of the Department of Agriculture have been allowed to shrink until they have less buying power today than at any time in the past three decades.

Under those conditions, problems of a special or regional nature, such as the salinity control problem, will simply go unaddressed unless a special effort is made on them.

We think S. 2202 offers such an effort, and urge its speedy adoption.

[The prepared statement of Mr. Sampson follows:]

NACD

STATEMENT

of

Neil Sampson, Executive Vice President, NACD

to

Subcommittee on Water and Power
Senate Committee on Energy and Natural Resources

June 22, 1982

on the

Colorado River Basin Salinity Control Act (S.2202)

Mr. Chairman. Members of the Committee...

I am Neil Sampson, Executive Vice President of the National Association of Conservation Districts, commonly known as NACD. We represent the 2,950 conservation districts in the 50 states, Puerto Rico, and the Virgin Islands, and the 17,000 conservation district officials which serve on the local boards that govern the day-to-day actions of those districts.

Conservation districts are established under state enabling legislation to develop and carry out land and water conservation programs at the local level. Districts coordinate the work of various federal and state agencies in providing assistance to landowners. They are presently providing services to over 2 1/2 million landowners and operators.

Our association is dedicated to encouraging the adoption of conservation methods of farming to protect the long-term productivity of the land. We believe special concern is needed for the future of the irrigated lands of the western United States, because of their particular problems, and also because of their significant contribution to the national agricultural industry.

**National Association of Conservation Districts**
Rm. 730, 1025 Vermont Ave., N.W., Washington, DC 20005
Phone (202) 347-5995

Irrigated lands produced 27 percent of the value of farm crops harvested in the United States in 1980, on only 12 percent of the harvested acres, so they are absolutely vital if this nation is to retain its high level of farm output.

Conservation districts have been supportive of salinity control efforts through on-farm water management practices for many years. This work is both effective and cost-efficient. We think the work that has been carried out under P. L. 93-320, the Colorado River Basin Salinity Control Act of 1974, has been a good example. This work has been supplemented by the targeting of funds within the Agricultural Conservation Program, the Conservation Operations program of SCS, and ARS research. The resulting projects have demonstrated that a concentrated USDA effort can be very effective in addressing the salinity problem.

One of the main features of these projects has been the search for an institutional arrangement that would facilitate rapid acceptance of new irrigation systems and techniques by farmers. This has involved the active participation of the local conservation districts.

The basic conclusion that we draw from this experience is that locally-operated projects, using the time-tested approach of federal cost-sharing and technical assistance delivered through local conservation districts, is an effective way to get improved irrigation water management, lower salinity in the receiving waters, and improve efficiency and productivity on the land.

Based on this experience, we support passage of S. 2202. We think there are some minor amendments that could strengthen the bill and make it more effective, and we have included them for your consideration.

We support exempting salinity control programs from the principles and standards (or any subsequent replacement guidelines). Salinity control programs are primarily water quality control programs, not water resource development projects, and can ill-afford the additional costs created by the extensive planning and review processes invoked by past principles and standards.

The on-farm water management work that needs to be done is very different from the other salinity control work in the Colorado River Salinity Control effort, and we support separating it out as an identifiable program under the Secretary of Agriculture. This would give the program stature, with separate funding, rather than existing, as it does today, as a drain on other cost-share programs.

The success of conservation programs conducted through long-term contracts with private landowners and operators has been proven. The Great Plains Program under the leadership of SCS is a prime example. Further, separating the program out from the Agricultural Conservation Program (ACP) would eliminate the present $3500 per-farm payment limitation that has limited the usefulness of the ACP in salinity control.

We would offer two amendments to the bill which are primarily technical amendments:

a) On page 8, line 10, add the following sentence at the end of the paragraph:

This program will be developed and implemented in cooperation with soil and water conservation districts established under state statutes and/or tribal laws wherever such lands are included within the boundaries of soil and water conservation districts.

This amendment would assure that the type of administrative structure proven so effective in past work would be an integral part of this new program.

b) On page 10, line 16, after the period at the end of the sentence, insert the following additional sentence:

The Secretary may utilize grants or cooperative agreements with conservation districts, local governmental agencies, colleges or universities, or others as appropriate to carry out the activities identified in subsection 202 (c)(2).

This amendment would prevent problems whereby federal personnel ceilings might preclude implementation of the on-farm program unless personnel are diverted from other areas of the country. This proposed provision would give USDA an alternative in management that we feel is more acceptable than adding more federal personnel to the payroll.

Mr. Chairman, we commend the Committee on its concerns with the serious problems facing irrigated agriculture in the semi-arid and arid regions of the country. We are also pleased that you recognize this as a problem which must be solved at the local level, through a specific program effort. The Nation faces many serious conservation problems today, led by a growing soil erosion problem on our rainfed croplands, and an impending Dust Bowl caused by the plow-out of marginal lands in the Great Plains. The traditional soil and water conservation programs of the Department of Agriculture have been allowed to shrink until they have less buying power today than at any time in the past three decades. Under those conditions, problems of a special or regional nature, such as the salinity control problem, will simply go unaddressed unless a special effort is made on them. We think S. 2202 offers such an effort, and urge its speedy adoption.

Senator Murkowski. Thank you, Mr. Boothby. We note your recommendation. Other than the Colorado, where else in your opinion do we have a high priority concern with salinity?

Mr. Boothby. This is the main one. There are some areas in Montana, however, where there was recent development of so-called saline seas.

This is not so much an irrigation problem as it is a land management problem. This is something which we feel needs to be addressed immediately as well.

Senator Murkowski. Thank you.

The next witness is Mr. Ronald Dudley, irrigation farmer, Uinta Basin, Randlett, Utah. We welcome your testimony, Mr. Dudley. Please proceed.

## STATEMENT OF RONALD DUDLEY, BOARD MEMBER, UINTA BASIN CONSERVATION DISTRICT BOARD, RANDLETT, UTAH

Mr. Dudley. Yes, indeed. It is a privilege to be at this proceeding, Mr. Chairman. In the interest of time, we have filed a statement, and I will just give a brief synopsis of it.

Senator Murkowski. It will be so noted in the record. Thank you, Mr. Dudley. Please proceed.

Mr. Dudley. As stated, I am a full-time farmer-rancher in the northeastern part of the State of Utah and in the Uintah Basin, which was the second chosen for onfarm salinity work.

I am here to speak in favor of Senate bill 2202 very strongly so because we feel that it addresses some of the problems which we at a local level have confronted in trying to put this project on the ground.

During the planning and implementation of the Salinity program on the ground in the Uintah Basin, I was involved in what was referred to as a steering committee, coordinating committee, which did the planning.

And we ran into, which has been previously mentioned by Mr. Barnett, problems with limitations of the ACP program. I do believe that this bill addresses those problems and is going to make it far easier to accelerate the program on the ground.

In the particular area I am from, the Indian tribe is the major landowner and the program, as administered by the ACP, addresses the tribe as one entity.

This Senate bill will change that and make it now possible to deal with 25,000 acres of irrigated land that the tribe has in that basin.

If you have any additional questions, Mr. Chairman, I would try to answer them for you.

[The prepared statement of Mr. Dudley follows:]

## Statement of
## the
## UINTAH BASIN SOIL CONSERVATION DISTRICT BOARD
## before the
## SENATE SUBCOMMITTEE ON WATER AND POWER
## presented by
## RONALD DUDLEY, BOARD MEMBER

Mr. Chairman:

I'm Ron Dudley, a full time farmer from the Uintah Basin, Utah. I am also a member of the Uintah Basin Soil Conservation District Board of Supervisors and have been for six years. One of my responsibilities as a board member has been to represent the SCD Board on the Uintah Basin Salinity Control Coordinating Committee. This committee, made up of federal and state resource agency representatives along with representatives from local units of government, serves as a technical advisory group to the Duchesne and Uintah County ASCS County Committees, both within the Uintah Basin salinity control project area.

As an SCD Board Member, I have been involved in establishing priorities and operating guidelines for our local Soil Conservation Service Field Office and Soil Conservation District employees in their efforts in providing technical assistance to the salinity control program. The SCD Board reviews all land treatment contracts for technical soundness, cost effectiveness, and resource impacts prior to submission to the ASCS Committees for federal cost-share assistance consideration.

During the formulation of the Uintah Basin work plan, I participated in the data collection and data evaluation processes. I reviewed all the alternatives and assisted in identifying the selected plan. When the program was released in 1980, I participated in developing local program direction working closely with local, state and federal government agency representatives, primarily with SCS, ASCS, and the ASCS county and state committees.

As you can see, I have been intimately involved with the salinity control program on the grassroots level in the Uintah Basin project area. I know what the successes and the problems of the program are on my level of involvement. I know what impacts are being made on the local natural resources and on the local economy.

Local acceptance of the program has been very satisfying. In 1980 and 1981, demands against the program far exceeded the financial limits of the program and our local staff's ability to provide technical assistance. Our multi-disciplinary planning, application, and management follow-up approach has proven to be a move in the right direction for providing well balanced, technical assistance to the local land and water users and fully evaluating impact on our natural resource base.

One hundred and eleven Long Term Agreements and 68 annual agreements were approved for cost share in 1980 and 1981. These agreements schedule implementation or installation of 130 miles of irrigation pipeline, 40 miles of sideroll sprinkler laterals, 107,000 linear feet of gated pipe, 29 regulating reservoirs, 730 acres of land leveling, 5,000 acres of pasture management, 11,000 acres of Irrigation Water Management and over 800 acres of Wildlife Habitat Management over the next several years. This represents over 6-million dollars worth of on-farm improvement already completed or scheduled for completion by 1984.

This year, an additional 50 to 55 Long Term Agreements and approximately 30 Annual Agreements will be approved for federal cost-share assistance and their implementation will add to the expanding number of irrigated acres being properly managed to reduce the salt loading impacts on the lower Colorado River system.

These accomplishments have not been easily achieved. There has been a great deal of cooperation from everyone involved. From the local level to the National level, everyone has worked hard to insure the success of the Salinity Control Program. There has also been a great deal of heart burn and gnashing of teeth on all levels to try and make ACP, a well conceived national program, fit our highly accelerated local program needs. There are some definite gaps or deficiencies in ACP which will not allow adequate and/or prompt resolution to the salinity problems in the Unitah Basin. Let me define some of these problem areas.

1. Annual cost share limits of $3,500 per year for an individual applicant and $10,000 per year for pooling agreement applicants, (more than 1 landowner) prohibits rapid on-farm land treatment, reduces the value of the federal cost share dollar through inflation of materials, equipment and labor over 4 to 5 years, and/or forces the program participant to borrow money in a high interest rate money market if they wish to make their improvements now and wait for annual distribution of funds.

2. ACP addresses only on-farm land treatment and doesn't address the problems of improving irrigation water delivery laterals. Delivery systems and on-farm systems must be planned and improved concurrently for efficient treatment of the salinity problem in the Basin.

3. ACP does not effectively deal with lands owned by the Ute Indian Tribe. Under ACP definitions, the Tribe is considered one land owner and can qualify for $3,500 annually unless they enter into a pooling agreement with another land owner in which case they could qualify for $10,000 annually. The Tribe owns almost one million acres in the Uintah Basin of which approximately 25,000 acres are irrigated.

   The Bureau of Indian Affairs also operates an extensive canal and ditch system to deliver irrigation water to thousands of irrigated acres both Tribal and non-indian. Improvement of this system is not being addressed.

4. Thirty-five thousand dollars per operating unit or contract limit set by ACP is also reducing the effectiveness of the Salinity Control Program. This limitation effects the larger land owners and family farms. Usually, $35,000 will effectively treat less than 100 acres of irrigated cropland.

5. Present funding rates under ACP will not allow for a reasonable time frame for effectively treating the salinity problems in the Uintah Basin.

These problems seem to be effectively addressed and resolved in the S.2202 legislation.

The Uintah Basin Soil Conservation District Board, the Uintah Basin Salinity Control Coordinating Committee, and myself are in full support of S.2202 and we encourage this committee and congress to approve this proposed legislation.

Thank you

Senator MURKOWSKI. Can you comment, from practical experience of farming the land, any personal observations on how this time schedule might be expedited.

It seems, as has been pointed out time and time again, we have been working on it for 10 years, we have four projects authorized, we have got a long way to go.

Is there a simpler way to do it?

Mr. DUDLEY. Always from the bottom it looks like there should be a simpler way. It looks like the professional people should be able to agree, from the bottom looking up.

There is a difference between the Department of Agriculture and the Department of the Interior. I think when you are talking about four projects you are talking about mainly Interior, meeting delivery systems.

What I am addressing are the USDA onfarm systems which have been implemented, I think, very well. I think there has been no real delay.

They did the water quality thing. They were talking about a project. In another year it was there. The work was being done on the farms.

Now the Interior—I don't mean to point fingers—has been talking about delivery systems and doing improvement work and lining and that sort of thing, a feasibility study, since 1975, and we have yet to see $1 spent in the basin.

Senator MURKOWSKI. But Agriculture has moved on?

Mr. DUDLEY. Yes. On farms the Department of Agriculture program has worked effectively. There has been far more interest than there has been money available to this point.

Senator MURKOWSKI. Your testimony expresses the cost effectiveness on the part of the Department of Agriculture, the planning and methodology.

You might for the record emphasize a more major role be played by Agriculture. Would you recommend that and do you have any general comments?

Do you feel Agriculture could better address this than Interior?

Mr. DUDLEY. I certainly have that feeling, and I may be biased in so stating, but just viewing the activity on the ground, it seems they are far more aggressive in getting the work done than Interior.

Senator MURKOWSKI. I think that is most to the point, Mr. Dudley, and I appreciate your testimony, and am open to recommendations.

It is up to those who will be examining the record to deliberate on your point of recommendation. I think it is an interesting one.

Mr. John Frezieres, president, Mesa Soil Conservation District and chairman, Land Use Committee. Good morning, Mr. Frezieres.

## STATEMENT OF JOHN FREZIERES, PRESIDENT, MESA SOIL CONSERVATION DISTRICT, AND CHAIRMAN, LAND USE COMMITTEE, COLORADO ASSOCIATION OF SOIL CONSERVATION DISTRICTS, GRAND JUNCTION, COLO.

Mr. FREZIERES. Good morning, Senator. It is certainly a pleasure for me to be here representing the Mesa Soil Conservation District, the State Association of Conservation Districts, and also I would like to indicate that I will be making a statement in behalf of both these organizations and also the Grand Valley Water Users Association, which I have a prepared statement for each.

Senator **Murkowski**. We will introduce those into the record.

Mr. **Frezieres**. I will try to summarize briefly some of the points based on the onfarm program. It has been stated that we are currently operating 560 acres of irrigated farmland.

Part of this is under the Grand Valley Users Association, where one unit has been placed. As president of the local district, we were asked in September of 1981 to make an indepth study of the salinity on farm program as had been conducted there.

And that was completed, and I will also submit that report to the record for information. First, I want to support a major theme of this bill, that of authorizing both the Secretary of Interior and the Secretary of Agriculture to develop a salinity recommendation program based on the experience gained through 3 years of activity in the Grand Valley of Colorado.

The resulting development of a strong, economically sound implementation program must utilize past experience and local input to make the salinity program effective.

In Colorado the agencies have worked well together in the salinity program but has been hampered by cumbersome processes and inadequate funding to fully meet the objectives of the Colorado River Basin salinity program.

Continued development of both the onfarm and off-farm programs simultaneouusly will assure a maximum salinity abatement in a timely, cost efficient manner.

The Soil Conservation Service is basically responsible for the onfarm program. They are working cooperatively with the Bureau of Reclamation and other organizations which have in the past identified most of the salinity problems as affected by the onfarm or the off-farm irrigation work controlling these sources.

This has proven to be the most cost effective of the alternatives being considered for salinity abatement. Three areas in Colorado have been specifically identified as producing significant salt.

These are the Grand Valley unit, the Lower Gunnerson unit, and the McElmo Creek unit. The fourth is now under study.

Let's look at the Grand Valley program as it has been under way since early 1979. During this period, 91½ miles of onfarm earth ditches and laterals have been lined with concrete or placed in pipelines to reduce seepage.

The reduced depercolation into the subsoils are resulting in some very great benefits. These accomplishments have already resulted in an annual reduction of 13,500 tons of salt in the Colorado River.

This is equivalent to a salt reduction of 1.4 milligrams per liter at Imperial Dam. The program, however, has been slower than needed to meet the requirements of salinity control in 10 years.

Federal funding for the Grand Valley unit has to be increased to over $4 million annually to achieve the planned total reduction at Imperial Dam.

The effectiveness of this would be $240,000 per milliliter of effect. The Department of Agriculture's report for onfarm portions of the Lower Gunnerson Basin unit was completed in September 1981.

This involves the work on 171,000 acres of irrigated land in the basin. The effect would be working on 1,370 miles of ditches and laterals at a cost of about $169 million-plus, reducing the salt loading by 335,000 tons.

This is equivalent to a reduction of 34.9 milligrams per liter at Imperial Dam, with an efficiency of $431,000 per milliliter.

The Department of Agriculture's draft report for onfarm improvements in the McElmo Creek unit has been released for public review at this time.

It involves an expenditure of $29,801,700, with a cost effectiveness of $761,000 per milligrams per liter. All of these studies have been given strong support from the local landowners.

I think that is an important point. The Federal Government's contribution, it needs to be pointed out, will be substantially reduced when you consider that the private landowners finance a portion of the cost of the improvements through the voluntary cost-sharing program that is set up in 2202.

The San Juan River basin is under study, as we said. It is estimated this would reduce 28,000 tons per year and would service about 10,000 acres.

I might point out that no funding has yet been made available from the Department of Agriculture sources for any area except the Grand Valley.

So you can see how vitally important the Colorado Association of Soil Conservation Districts and the various local soil conservation districts feel concerning S. 2202 in Colorado.

We strongly urge the committee to act on this legislation promptly so it can be authorized before adjournment. In summary, as far as the soil conservation district's testimony is concerned, we support Senate bill 2202.

The amendments are needed to, one, direct the Department of Agriculture to develop an onfarm salinity control program; two, to authorize increased funding to expand the onfarm program, including the development of a stronger educational and public relations program and, three, to support authorization for the continued improvement of irrigated systems which are essential.

I would like to at this time shift gears and cover the written testimony submitted by the Grand Valley Water Users Association.

Senator MURKOWSKI. Why don't you submit that for the record as well. You are obviously well over 5 minutes allocated, if you would care to summarize it briefly.

Mr. FREZIERES. The Grand Valley Water Users basically is the operating unit. It is in this area that the stage one program was established.

It concerns the 40,000 acres under their jurisdiction. We have found—and I might just summarize the basic conclusions in summary on S. 2202 as now written.

First of all, they would like to have flexibility in lining canals or laterals or placing them in pipe as conditions warrant; two, specific language to address wildlife mitigation; three, authorization of other salinity control units; four, support and funding for the Department of Agriculture's onfarm programs and to tie the systems delivery on the onfarm together, which is essential.

Senator **Murkowski**. Thank you very much for that testimony and the items submitted within the 10-day period or this morning will be noted in the record.

[The prepared statements of Mr. Frezieres follow:]

# Testimony
to
# SUBCOMMITTEE ON WATER AND POWER
of the
# SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

June 22, 1982

by
John Frezieres, President, Mesa Soil Conservation District
and
Chairman, Land Use Committee, Colorado Association of Soil Conservation Districts.

Mr. Chairman and members of the subcommittee, I am John Frezieres of Grand Junction, Colorado. In the past 12 years I have operated 560 acres of irrigated farmland served by two of the major irrigation companies in the Grand Valley. I currently irrigate 200 acres. Two of my fields are irrigated using newly completed irrigation systems. These systems were installed with assistance through the present salinity control program. Because of this, I am pleased to have this opportunity to testify today on amendments to the Colorado River Basin Salinity Control Act as proposed in S. 2202. Further, I am president of the Mesa Soil Conservation District and chairman of the Land Use Committee of the Colorado Association of Soil Conservation Districts. I am authorized to present this statement in behalf of these organizations also.

First, I want to support a major theme of this bill--that of authorizing both the Secretary of the Interior and the Secretary of Agriculture to develop a salinity reduction program based on the experiences gained through three years of onfarm improvement work in the Grand Valley of Colorado. Agencies of these two departments have important roles to play in working with citizens to solve these land and water management problems. The resulting development of a strong economically sound implementation program must utilize past experience and local input to make the salinity abatement program most meaningful. In Colorado, the agencies have cooperated and worked very well together in the salinity control program, but have been hampered by cumbersome procedures and inadequate funding to fully meet the objectives of the Colorado River Basin Salinity Control Act. Continued development of both the onfarm and off-farm programs simultaneously will assure maximum salinity abatement in a timely cost-effective manner.

In Colorado, the Soil Conservation Service has overall leadership for the Department of Agriculture efforts in addressing the onfarm phases of the salinity program. Working cooperatively with the Bureau of Reclamation, private irrigation districts and companies, and other organizations, most of the areas which result in salt loading from irrigated agriculture are now being identified. Controlling these sources has proven to be the most cost-effective of the alternatives being considered for salinity abatement.

Three areas in Colorado have been specifically identified as producing significant salt contributions from irrigation. These are the Grand Valley unit, the Lower Gunnison Basin unit and the McElmo Creek unit. A fourth smaller area, the Mancos Valley unit in the San Juan River Basin, is currently being studied to determine the extent of salt loading from that area.

The Grand Valley Salinity Program has been underway since early 1979. Implementation of onfarm salinity control practices has been funded through the regular Agricultural Conservation Program administered by the Agricultural Stabilization and Conservation Service. Since that time, over 91 1/2 miles of onfarm earth ditches and laterals have been lined with concrete or placed in pipelines to reduce seepage. Farmers have also been provided assistance in proper management of their irrigation waters to avoid unnecessary over-application to their fields, reducing percolation into the salty subsurface soil layers. These accomplishments have already resulted in an annual reduction of 13,500 tons of salt to the Colorado River. This is equivalent to a salt reduction of 1.4 milligrams per liter at the Imperial Dam.

However, the current Department of Agriculture program has provided insufficient funding for staff and practice implementation to accomplish the Grand Valley onfarm program as scheduled. Progress has been slower than needed to meet the requirement of salinity control in 10 years. Annual federal funding for the Grand Valley needs to be increased to over $4 million in order to achieve the planned total reduction of 13.5 milligrams per liter per year at Imperial Dam. This reduction would have a cost-effectiveness of $274,000 per milligram per liter.

The Department of Agriculture report for the onfarm portion of the Lower Gunnison Basin Unit was completed in September 1981. This report recommends improvements in onfarm irrigation water management for the 171,000 acres of irrigated land in the basin. The seepage would be reduced by the installation of 1,370 miles of ditch lining or pipeline. The total cost of implementation is estimated to be $169,400,000. The study indicates that these improvements will reduce the salt loading by 335,000 tons per year. This is equivalent to a reduction of 34.9 milligrams per liter at Imperial Dam having a cost-effectiveness of $431,000 per milligrams per liter.

The Department of Agriculture draft report for onfarm improvements in the McElmo Creek Unit has been released for public review with the final report expected to be completed in September. Recommendations include installation of irrigation water management improvements at an estimated cost of $29,801,700. These accomplishments will produce an estimated 38,000 tons per year reduction in salt loading and a reduction of 3.6 milligrams per liter at Imperial Dam with a cost-effectiveness of $761,000 per milligrams per liter.

All of these studies have been given strong support from the local landowners. The cost-effectiveness figures represent the total cost for installing the onfarm program. The federal government's contribution will be substantially reduced when you consider that the private landowners finance a portion of the cost of the improvements through the voluntary cost-sharing program as provided by Section 202(c)(1) of S. 2202.

Preliminary studies in the Mancos Valley area of the San Juan River Basin Unit indicate that a salt loading of about 28,000 tons per year is being contributed by the 10,000 acres of irrigated agriculture in this valley.

No funding has as yet been made available from Department of Agriculture sources for any of the areas except the Grand Valley, and it is doubtful that funding from this same source will continue.

So you can see how vitally important the Colorado Association of Soil Conservation Districts, the various local Soil Conservation Districts and the private landowners feel S. 2202 is to Colorado as well as to the total salinity control effort. The amendments would authorize implementation of the additional units and permit the Department of Agriculture to proceed with treatment of the irrigated lands with funds specifically allocated to the salinity control program. We strongly urge the committee to act on this legislation promptly so it can be authorized before adjournment of this session. We need to move along quickly if we are to develop better program guidelines and regulations so that these vital cost-effective programs can be implemented on schedule.

## SUMMARY

In summary, we support Senate Bill 2202 as now written. The amendments are needed to:

1. Direct the Department of Agriculture to develop an onfarm salinity control program.
2. Authorize increased funding to expand an off-farm program including the development of a stronger educational and public awareness program.
3. Support authorization for the continued improvement of irrigation water delivery systems which are essential for the planning and development of the onfarm program.

## STATEMENT BY THE GRAND VALLEY WATER USERS ASSOCIATION
## IN SUPPORT OF SENATE BILL 2202
## 97TH CONGRESS - 2ND SESSION

Mr. Chairman and members of the subcommittee, I am John Frezieres of Grand Junction, Colorado. In the past 12 years, I have operated 560 acres of irrigated farm land served by two major irrigation systems in the Grand Valley, one of which is operated by the Grand Valley Water Users Association, the preparer of this statement. I have been associated with salinity control activities in the Grand Valley of Colorado from the beginning as a landowner, irrigator, Soil Conservation District co-operator and businessman. I am authorized to present this statement to you on behalf of the Grand Valley Water Users Association.

I am here to represent the Grand Valley Water Users Association and present testimony in support of Senate Bill 2202 which would amend the Colorado River Basin Salinity Control Act and authorize certain additional measures to assure accomplishment of the objectives of Title II of such Act.

The Grand Valley Water Users Association operates and maintains the Grand Valley Project located in western Colorado. It is one of the earliest Reclamation projects, having delivered its first water from the Colorado River to the irrigators in 1915. Since that time, the project has provided reliable and consistent irrigation service for some 40,000 acres of very productive land growing a variety of crops. Some of the main crops are peaches, apples, alfalfa, corn, forage, beans, and onions. The project's indebtedness to the United States for its original construction has been paid and repayment schedules for two rehabilitation loans are current and up to date with only $1,294,000.00 remaining to be paid.

Beginning in the late 1960s with the Federal Water Quality Control Act and amendments thereto, plus additional environmental oriented legislation and related controls and regulations, it became apparent that users of Colorado River water were facing problems and challenges far different from any experienced to date. This was especially true of the Grand Valley which was being cited from all directions as a major polluter because of its alleged salinity contribution to the river.

Over the next several years, a great deal of interest was generated and effort expended in attempting to develop a method and means for salinity control in the Grand Valley with the Grand Valley Water Users Association and other local irrigation and drainage organizations cooperating in every reasonable way. Among its activities, the Association participated in efforts that eventually produced Public Law 93-320, the legislation being considered for amendment at this hearing.

Under Title II, Section 202 of the Act, dealing with the Grand Valley unit, considerable study and investigation was undertaken both on and off Grand Valley farms to develop design and preconstruction data which eventually contributed to the selection of a portion of the Association-operated irrigation system for construction as a demonstration project known as Stage One, Grand Valley unit, Colorado River Basin Salinity Control Project. Stage One represents approximately 15 percent of lands served by the Grand Valley Project.

The Grand Valley Water Users Association and the United States executed a contract dated March 11, 1980, providing for rehabilitation, operation, and maintenance by the Association of salinity control facilities to be constructed on the Grand Valley Project.

Construction began on concrete lining of the 360 cfs main canal in late summer of 1980 and through exceptional performance by the contractor, the 6.8 miles of Stage One canal lining with related facilities was essentially completed and in service by the beginning of the next irrigation season on April 1, 1981.

Following the 1981 irrigation season, work was begun on piping 29 miles of laterals flowing from the lined canal to the irrigator's lands. As of June 15, 1982, approximately one-third of the laterals are piped with work proceeding and scheduled for completion by October 1983.

While it is too early to conclusively evaluate the impact of Stage One activities to date on Colorado River salinity, some of the changes that are known to be occurring are:

1. Lands water-logged by seepage from the original unlined canal that was contributing water to the undergroud salt-laden stratas and which ultimately carried salt to the Colorado River, are now drying out and even in some cases, capable of being put back into production.

2. A system of wells for monitoring salt-carrying groundwater thought to be stemming from the original unlined canal, are now showing little, if

any, water following lining of the canal. The same observation is true concerning certain open drain channels in the vicinity of the canal.

3. To the extent lateral piping has been achieved to date, similar results to items 1 and 2 above are being observed. Even in the absence of scientific documentation not yet available, it can be logically stated that because water is not escaping from the lined and piped ditches, it is not available to seep into the salt-bearing underground stratas and carry salt to the river. A pre and post construction monitoring network has been established in Stage One to measure salinity reduction and impacts to wildlife.

In addition to salt abatement directly achieved by lining and piping of canals and laterals, it should be strongly emphasized that existing canal and lateral systems are incapable of effectively serving new, modern, and sophisticated water application systems for on-farm use as proposed by the salinity program to maximize efficiency of irrigation on the farms to minimize salt contribution to the Colorado River. Therefore, off-farm irrigation systems improvement plays a vital role in implementing on-farm irrigation efficiency and the widely recognized salinity abatement benefits therewith associated.

As is usually the case in any major undertaking, experience gained along the way often shows there is need for additions or deletions to original planning, as in this case there is need to amend the Colorado River Basin Salinity Control Act as provided by S. 2202. Having been a party to salinity control in the Colorado River as previously recited and as operator of the irrigation system on which the first systems improvement construction under the salinity program was undertaken, the Grand Valley Water Users Association believes that favorable results can be achieved in the abatement of Colorado River salinity by pursuit of the programs authorized by the Colorado River Basin Salinity Control Act as would be amended by S. 2202. We sincerely solicit your prompt and favorable vote on S. 2202 as well as your support for the entire salinity control program whenever possible.

## SUMMARY

In summary, we support S. 2202 as now written and the amendments are needed to provide:

1. Flexibility in lining canals or laterals or placing them in pipe as conditions warrant.
2. Specific language to address wildlife mitigation.
3. Authorization of other salinity control units.
4. Support and funding for the Department of Agriculture's on-farm programs.

Thank you for the opportunity to make our views known on this important issue.

Mesa Soil Conservation District
P.O. Box 2418 · Grand Junction, Colorado 81502 · Phone (303) 242-4511

## Grand Valley Salinity Program

Evaluation and recommended changes to improve the effectiveness and quality of the salinity program.

September 14, 1981

The following report was prepared by the Mesa Soil Conservation District following a complete in-depth evaluation of the Grand Valley Salinity program from its inception to the date of this report.

The following individuals, organizations and government agencies have contributed input which has been incorporated into this report.

a. Local Lateral and Ditch Co.
b. Mesa Soil Conservation District
c. Soil Conservation Service
d. Bureau of Reclamation
e. Colorado State University
    1. Extension Service
    2. C.S.U. Agriculture Research
f. U.S.D.A. Agriculture Research Service
g. Grand Valley Salinity Coordinating Committee
h. County ASC Committee and local staff
i. Landowners--farmers and ranchers
j. Grand Junction Chamber of Commerce
k. Colorado State Water Conservation Board
l. Local contractors working on the salinity abatement program
m. U.S. Geological Service
n. Environment Protection Agency
o. Colorado Division of Wildlife
p. Federal Wildlife Service
q. Upper Colorado River Committee

Before one can fairly evaluate the Grand Valley Salinity program it is essential that a sound basis for understanding be established.

During the past thirty years, high quality water, low in desolved salts, has been diverted from the Colorado River basin in ever increasing amounts. The essential and effective dilution of the water of this drainage at the lower elevation has been greatly reduced. When this condition is coupled with increased use along the river as well as the added salts to the river from mineral hot springs, deep percolation of irrigation and natural run off returned from open land, the resulting increase in salinity of the water in the lower reaches of the river is predictable. For more than twenty years local research working on drainage and water management in the Grand Valley have been concerned with the ever increasing salt loading of the Colorado River waters. The Grand Junction Chamber of Commerce along with the Mesa County Extension Service brought together a group of interested land owners and research people in the mid-1950's to evaluate the problem and develop recommendations for improved irrigation management in the Valley. The first preliminary water scheduling work was initiated through this group. With the development of the first study work on salinity control, the original water scheduling activities being encouraged by the Grand Junction Chamber of Commerce were incorporated into the Bureau of Reclamation's over all salinity program. Original members of the Chamber of Commerce water scheduling committee were appointed to the long standing, currently operating Salinity Coordinating Committee which is operating as an advisory committee to the Bureau.

After many years of study of the salinity problem and three years of on-farm salinity implementation work, the Mesa Soil Conservation District feels qualified to evaluate and make strong recommendations as to what is needed in this water management program for the Grand Valley.

The total salinity effort directed into the Grand Valley area must be under the control of one agency, therefore, we would recommend that all programs and all funds be directed through the Bureau of Reclamation. The other agencies involved in salinity work would assume their responsibilities under this type of authorization. (Example): Past experience derived from the Welton-Mohawk project should be used as a guide in the structuring of future salinity work on the Colorado River and specifically in the Grand Valley. The Grand Valley Salinity Control Program must be specifically designed to meet the diversive needs of this area and to accomplish maximum salinity control in the most cost efficient manner. Trying to fit a salinity program into the on going Agricultural Conservation Program, which is what has been done to date in the Grand Valley, has not worked effectively and is not a cost efficient method of operating the on-farm salinity improvement program. This is a salinity control program not just a conservation program.

The new concept for organization in the Grand Valley concerning on-farm programs must accomplish the following conditions:

1. Change the present concept of mandatory semi-automated irrigation to a new more flexible concept of controlled irrigation, which ranges in scope from non-automated free flow systems to completely automated systems, depending on which one provides the most practical salinity control possible for each parcel of land in the project area.

2. Increase the flexibility of the on-farm salinity program as set forth in this report, so that it can meet the demand of the wide ranges of conditions of soil types, topography, farming practices, cropping plans, and human involvements that exists in the Grand Valley. An effective salinity program must also be cost effective.

3. Restructure the salinity program to allow for improving the design and planning processes required in the individual on-farm plans for each parcel of land in the salinity area. Only through proper design can salinity control be more efficient. The design problems that must be addressed in this broadened plan are:

   a. Wide variation in soil types
   b. Wide variability of topography
   c. Fluxuating water supplies
   d. Variability of salt loading in the Valley
   e. Trash, silt and foreign matter in the waters of the Valley
   f. Variability of water rights

g. Sub-division contribution to salinity
h. Variation in crop rotation systems
i. Variation in crop water requirements
j. Quantity and delivery schedule of irrigation water in the Valley
k. Variation in valley wide drainage practices

4. Change the present on going salinity program in the Grand Valley to make the program more manageable, cost efficient and effective by:

a. Restructure the funding of the on-farm salinity program. (Patterned after Welton-Mohawk)
   1. Set all on-farm cost-share rates at an 80% level.
   2. Remove the annual funding restriction of $3,500.00 or $10,000.00 for and individual producer.
   3. Recognize the entire Grand Valley area as a single project area.
   4. Establish a tax exemption for income received by producers who participate in the cost-share monies through the salinity program.

b. Perform on farm salinity work in the Grand Valley on a lateral by lateral basis. For most efficient planning, the laterals should be designed and constructed preceeding the on-farm work under the lateral. The entire cost (100%) of lateral work should be borne by the Federal Government.

c. Develop a strong educational program, which is adequately staffed and funded, that is charged with the responsibility of providing assistance to the land owner in the planning, development and operation of their irrigation system, put in under the salinity project. Further, the education program would assist in the development of an on going evaluation of irrigation systems and provide land owners with information concerning needed change in their systems to make them operate effectively. The educational efforts would also assist with the development of programs to encourage lateral reorganization.

d. The approval of additional funding for renovation of systems when necessary, where a designed approved system that has been installed can not be made to operate satisfactorily. (The current technology is new and not fully tested.)

e. Develop a strong knowledgeable local committee who can evaluate and give direction and recommendation to all individuals and agencies concerned with funding and implementation of the Grand Valley Salinity program.

f. Include the entire irrigated area of Mesa County in the salinity control program. Major salinity contributing areas such as DeBeque, Whitewater, Redlands, and Plateau Valley are not being addressed by the present Grand Valley salinity project.

g. Add the following additional practices to the program to give the increased flexibility for maximum salinity control that has been brought out in this report.

1. Drainage work when needed to control a major salinity problem.
2. Waste water management control when a major salinity problem can not be controlled by other practices.
3. Wildlife habitat mitigation must be a part of a strong salinity control program.

h. Authorize the participation of incorporated laterals and private water distribution systems in the salinity program in the Grand Valley.

During the three year implementation period of on-farm salinity work, four appeals have been filed as a result of major problems. The Mesa Soil Conservation District has examined these problems in-depth and find that if the changes recommended in this report are implemented that these four problems will be resolved.

As these recommended changes are authorized it is essential that a smooth transition from the present on-farm program to the new, more flexible program, take into account the need to complete present projects that are under development on a field or farm. The completion of an on going project must have first priority.

The preceeding report was prepared by the Mesa Soil Conservation District. The members of the board are Joan Kruckenburg, Treasurer, Ken Weimer, Secretary, Charles Currier, Vice Chairman, Duane Clymer, Member, and John W. Frezieres, Chairman.

Mesa Soil Conservation District

John W. Frezieres

John W. Frezieres

Senator **Murkowski.** I want to thank the panel for your outstanding and expert testimony. I think you have been very helpful in your recommendations and suggested amendments in regard to the bill, and I commend you for not having had to go through OMB before giving your testimony.

I am sure it freely represented the professional opinions of your association and I wish you luck. We will proceed with the balance of the panel: Mr. David Kennedy, assistant general manager, Metropolitan Water District, Los Angeles, Calif.; Mr. Ira McKeever, president, Western Mining Operation, W. R. Grace & Co., Denver, Colo.

Mr. Dan Beard, representing the Ute Indian Tribe will not be here this morning and will submit something for the record.

[Subsequent to the hearing the subcommittee received the following:]

JUL 9 1982

Uintah and Ouray Agency
Ute Indian Tribe
P.O. Box 190
Fort Duchesne, Utah 84026

(801) 722-5141

June 28, 1982

SENATE COMMITTEE ON
ENERGY AND NATURAL RESOURCES
RECEIVED
JUL 12 1982
WASHINGTON, D.C. 20510

The Honorable James McClure, Chairman
Committee on Energy and Natural Resources
U.S. Senate
Washington, D.C. 20510

Dear Mr. Chairman:

This letter presents the views of the Ute Indian Tribe on S.2202, a bill to amend the Colorado River Basin Salinity Control Act of 1974. We recommend enactment of the bill with the amendments discussed below.

The Colorado River Basin Salinity Control Act (P.L. 93-320, 43 U.S.C. 1571 et. seq.,) provides for the construction, operation and maintenance of certain works in the Colorado River Basin to control the salinity of water delivered to users in the United States and Mexico. Title II of the Act provides for programs to control the salinity upstream from Imperial Dam to meet standards established by the seven Colorado River Basin States. This title also authorized construction of four salinity control units: Parados Valley and Grand Valley Units, Colorado: Crystal Geyser Unit, Utah; and Las Vegas Wash Unit, Nevada.

S.2202 would amend the 1974 Act in serval ways. First, the bill would require the Secretary of the Interior to give priority to units which "reduce salinity. . .at the least cost per unit of salinity reduction." (Sec. 1(2)). Second, it would authorize construction of six additional salinity control units in Colorado, Utah and California. Third, the Secretary is authorized "to improve additional portions of interconnected canal and lateral systems" where the costs are determined to be satisfactory to the Secretary. Fourth, the bill would authorize the Secretary of Agriculture to establish a voluntary cooperative program with private landowners to improve on-farm management and reduce watershed erosion.

Lands presently irrigated on the Uintah and Ouray Indian Reservation would be included in the proposed Uintah Basin Unit. See: Sec. 1(6) (7) of S.2202. As described in Uintah Basin Unit, Status Report (dated July, 1981), Indian and non-Indian lands in the Uintah Basin contribute about 500,000 tons of salt annually to the Colorado River, a significant portion of which comes from irrigated areas. Some Indian irrigation works would be lined or rehabilitated under the proposed plan. Given the decreases in salinity which will result from these improvements, we believe the improvements suggested in the Status Report and proposed in S.2202 would be justified.

However, our support for such rehabilitation work is premised on repayment of facilities serving Indian lands being made pursuant to the Leavitt Act (25 U.S.C. 386a). (See: Sec. 1 (7)(b)(3) of S.2202.) Should this section be altered, we could not support enactment of the bill.

In addition, we would suggest two other amendments which we believe to be essential. First, Indian lands should be eligible to participate in the voluntary cooperative program with the Secretary of Agriculture to improve on-farm management and reduce watershed erosion. We believe it is arbitrary to authorize such a program for private lands and not extend it to Indian lands. Second, we support the addition of Indian tribes as members of the Colorado River Basin Salinity Control Advisory Council. At present, the Council is composed of three members from each state in the Colorado River Basin. We believe adding three members from Indian tribes would greatly assist the effective implementation of the Act.

Language to implement both suggested changes is attached.

We appreciate this opportunity to provide you with our views.

Sincerely,

Homey Secakuku

Homey Secakuku, Chairman
Uintah and Ouray Tribal
Business Committee

MS;wv
Enclosures
cc Jason Cuch, Resources Director

Attachment A

## AMENDMENT TO S.2202 TO INCLUDE INDIAN LANDS IN THE AGRICULTURE PROGRAM

-- p. 8, line 6, after "private" insert "and Indian".

-- p. 8, line 8, before "non-Federal" insert "Indian and".

-- p. 8, line 17, after "interests" insert ", including Indian tribes".

-- p. 9, line 5, after "lands" insert ", including Indian landowners,".

-- p. 9, line 13, delete the semi-colon and add ", and except that in the case of facilities serving Indian lands, any repayment of costs pursuant to this section shall be subject to the Leavitt Act (25 U.S.C. 386a),"

-- p. 10, line 5, add the following new subsection: "(D) the Chairman of any Federally-recognized Indian tribe where measures are to be implemented,"

-- p. 10, line 10, after "Governor," insert "involved Indian Tribe,".

Attachment B

## AMENDMENT TO S.2202 TO INCLUDE INDIAN TRIBES AS MEMBERS OF THE SALINITY ADVISORY COMMITTEE

-- p. 12, line 18, add the following new subsection:

(15) at end of the first of subsection (a) of section 204 (43 U.S.C. 1594 (a)), by inserting the following at the end of the sentence: "and three members of Indian tribes in the Basin appointed by the Secretary of the Interior.".

Senator **Murkowski**. Mr. Clayton Smith, Solar Energy Research Institute, Golden, Colo. Mr. Smith, we welcome you to the witness table.

And Mr. Brent Blackwelder, Washington representative, Environmental Policy Center, Washington, D.C. And lastly, Mr. Pat O'Meara, who will get no further introduction.

We will begin with the testimony of Mr. Kennedy. We welcome you, Mr. Kennedy, and look forward to your testimony on this bill. Please proceed.

## STATEMENT OF DAVID KENNEDY, ASSISTANT GENERAL MANAGER, METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Mr. **Kennedy**. My name is David Kennedy. I am assistant general manager of the Metropolitan Water District of Southern California.

We do have a prepared statement which I will submit for the record, but in the interest of time I will make a few brief comments.

We serve approximately 12 million people. I think it is 12,200,000. We provide much of the municipal and industrial water in southern California.

It is water that we provide that is used primarily by people for municipal and industrial purposes. A relatively small amount is for irrigation.

This problem has been a concern for us ever since we started taking Colorado River water in 1941. It has been a problem of increasing significance over the years, but particularly penalty costs that our people suffer due to corrosion, to public health problems, and to general problems that industrialists have when they use water of high saline content.

One personal observation I might make about this: I have been involved in this particular program since the beginning of it in 1971.

While there have been some discouraging steps along the way—and there have been some observations today about the slowness of the program, and that is certainly true—nevertheless, it is discouraging to sit here in 1982.

It is encouraging to realize that we have made progress. What we need today is to make the program practical. This bill is based on the experience we have had since 1974 of trying to implement it, and it represents the experience of a lot of people who have worked a long time.

So while there has not been enough progress, nevertheless, there has been progress and this bill is the key step now in moving forward with a practical program.

I would stop there, Mr. Chairman. I would be happy to answer any questions on behalf of Metropolitan.

[The prepared statement of Mr. Kennedy follows:]

## STATEMENT OF THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA REGARDING SENATE BILL S. 2202*

My name is David Kennedy. I am Assistant General Manager of the Metropolitan Water District of Southern California. Metropolitan is a wholesale water district that imports and distributes water to the coastal plain of Southern California. Metropolitan is composed of 27 member agencies located in six counties. Within Metropolitan's service area there are 131 cities and about 12.4 million people, which is over one-half of the population of the State of California.

The function of the Metropolitan Water District is to supply the supplemental water demands of its member agencies; that is, the demands that cannot be met from their own local supplies. The total amount of water used for all purposes within Metropolitan's service area is currently about 3.3 million acre-feet per year. This year Metropolitan will supply about 1.6 million acre-feet or about one-half of the water used in Southern California.

Metropolitan has two sources of imported water which it distributes to its member agencies. One is the Colorado River from which water is conveyed to Southern California by Metropolitan's 242-mile-long Colorado River Aqueduct. The other is the California State Water Project. This project conveys water from Northern

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*Presented before the Subcommittee on Water and Power of the Senate Committee on Energy and Natural Resources on June 22, 1982.

California to Southern California by means of the 444-mile-long California Aqueduct.

At the present time, Metropolitan uses approximately equal amounts of these two water supplies. Because of our considerable use of Colorado River water, we share the concern of other users about the increasing salinity of the river. We have read the statements being presented today by the Colorado River Board of California and by the Colorado River Basin Salinity Control Forum, and fully support their views.

Decreases are projected for both of Metropolitan's water supplies, and shortages in meeting water demands are anticipated. As a result of the U.S. Supreme Court's 1964 Decision in Arizona v. California, a large decrease will occur in Metropolitan's Colorado River supply in 1985 when the Central Arizona Project is scheduled to commence operation. Moreover, as a result of the Special Master's recent recommendation to the Supreme Court, increased Indian water rights may further reduce Metropolitan's rights to Colorado River water. Metropolitan's supply of State project water is projected to gradually decline as increasing use is made of this water in the areas of origin.

These two water supplies differ markedly in their salinities. The total dissolved solids (TDS) of the State project water averages around 300 milligrams per liter (mg/l), while the TDS of the Colorado River water is about 700 mg/l. The two supplies are blended to achieve a TDS of about 500 mg/l for the water supplied to most of Metropolitan's service area.

The bulk of Metropolitan's water is supplied for urban uses such as residential, municipal, commercial, and industrial uses. About 15 percent is used for agricultural purposes. Much of the water used for agriculture is unblended Colorado River water. The TDS of the blended water is equal to the maximum recommended limit of 500 mg/l under the Secondary Drinking Water Standards of the Safe Drinking Water Act.

Metropolitan is primarily concerned about the economic impacts of further increases in the salinity of its Colorado River supply on the urban water users in its service area. Detrimental impacts include decreased productivity and increased production costs for industrial users, and reduced life of plumbing pipes and fixtures, and appliances in the case of household uses. Taste and health effects are other detrimental impacts for household uses.

While the economic impacts of increased salinity on urban water uses are real and significant, they are nonetheless difficult to evaluate. One of the most recent studies of these impacts is summarized in a December 1980 report of the Bureau of Reclamation, titled: "Colorado River Salinity--Economic Impacts on Agricultural, Municipal and Industrial Users." Based on salinity damages given in this report, the economic detriments for both Colorado River water and State project water were determined in 1981 dollars.

The incremental damages resulting from the use of Colorado River water as compared to State project water in Metropolitan's service area were calculated to be about $105 per acre-foot. This is based on the present TDS of Colorado River water. Any increase in the TDS level would result in even greater damages relative to State project water. Thus the damages that occur in Metropolitan's service area from the import of 800,000 acre-feet of Colorado River water, as compared to the use of State project water, amount to $84 million annually, based on information given in the cited report.

Other investigators have determined widely varying values of economic detriments resulting from salinity. There is much uncertainty in these evaluations. The values from the recent study are two to three times higher than those previously reported in the literature.

The use of high-salinity water increases the total demand for water by both agriculture and industry. Irrigation uses are increased because of the need for additional leaching to prevent salt buildup in the root zone of crops. It has been estimated by Metropolitan that the use of Colorado River water in lieu of State project water will increase industrial water demand by between 25,000 and 50,000 acre-feet per year as a result of diminished reuse potential.

Another detrimental consequence of Colorado River water's high salinity is that its use may result in violation of the basin plans prepared under the Clean Water Act. The increase in salinity of Colorado River water after a single use could violate the water quality criteria when treated wastewater is put in spreading basins for groundwater replenishment. This could result in decreased groundwater replenishment and a further reduction in the dependable water supplies for Metropolitan's service area.

Still another detrimental effect of the use of saline Colorado River water in Southern California has to do with the reuse of reclaimed wastewater for purposes other than groundwater replenishment. Since each use of water adds from 250 to 300 mg/l of minerals to a water supply, the lower the TDS the more times the water may be reused before it must be discarded or desalinated. Current efforts to increase the reuse of wastewater in Southern California could be inhibited if the salinity of Metropolitan's blended water supply gets too high as a result of the increased salinity of Colorado River water.

The Metropolitan Water District is in full support of Senate Bill S. 2202. We believe it is essential to California and to the United States that the Colorado River salinity standards established by the Environmental Protection Agency be met. Meeting these standards will not be easy and major efforts by all concerned will be required. The history of this planet is replete with stories of civilizations that disappeared because they failed to recognize and solve salinity problems.

Senator MURKOWSKI. Do you have any specific suggestions that you feel might expedite the movement? Do you feel that the situation as far as our relationship with Mexico is indeed critical?

You have taken some satisfaction in the fact that progress has been made, recognizing it has been made in some time frame of 10 years or thereabouts.

Mr. KENNEDY. In a way, you can divide this problem into three as to who has got the problem: The irrigators have a problem, we have a problem with Mexico which has been very serious at times, and then all the people that we serve in southern California have a problem.

I wouldn't want to characterize as to which of those is the most critical. I think we are all in this together, and certainly one of the most unique aspects of this problem is that you find seven states who historically have had many things to fight on are all working together on a common purpose.

Senator MURKOWSKI. I appreciate your perspective. In the last 2 or 3 years, since you are pulling the water just before it goes over to the border, is it much worse?

Mr. KENNEDY. We haven't seen it get much worse. We don't see much change year to year, but over time we can see it is going to get worse.

Senator MURKOWSKI. The last 2 or 3 years has it gotten worse, in your professional opinion?

Mr. KENNEDY. It has gotten worse in the basin as a whole, but it has not gotten worse to us. The particular thing that we need has been a commitment from the administration.

You heard today the temper rising as to whether there is going to be strong support or not. The one thing we needed from the very beginning is a strong support from the administration that this is something that has to be done.

I was encouraged by some of the testimony today that there does seem to be a move in the right direction, but there is not that absolute commitment that this project has to be done.

This is one of those problems that is not going to go away.

Senator MURKOWSKI. Has there been any emphasis put on by the California State Legislature?

Mr. KENNEDY. We have had support from the legislature in the form of resolutions, but this is recognized as mainly an interstate problem.

Senator MURKOWSKI. Is your delegation unified?

Mr. KENNEDY. Yes, indeed.

Senator MURKOWSKI. A delegation doesn't have to submit itself to OMB for its recommendations?

Mr. KENNEDY. No, sir.

Senator MURKOWSKI. I appreciate your testimony, Mr. Kennedy.

Mr. KENNEDY. Thank you.

Senator MURKOWSKI. I think you have again put the perspective that progress is being made and we have just got to go ahead and make a little more.

The next witness will be Mr. Ira McKeever, president of the Western Mining Operation for W. R. Grace & Co. I believe, Mr. McKeever, that during previous testimony, W. R. Grace has been recognized as having some technical capability in the area of desalinization or whatever. Please proceed.

## STATEMENT OF IRA E. McKEEVER, PRESIDENT, WESTERN MINING OPERATION, W. R. GRACE & CO., DENVER, COLO., ACCOMPANIED BY JOHN THURMOND, VICE PRESIDENT, W. R. GRACE & CO., WASHINGTON, D.C.

Mr. McKEEVER. I would like to paraphrase my statement that has been submitted and request the total statement be included in the record.

My interest in being here this morning is to express support for Senate bill 2202 and specifically two concepts contained in these amendments.

One, encouragement of the industrial use of highly saline waters, and two, the need to provide the option for joint public-private sector projects for the use of highly saline waters.

Today, I want to specifically address the proposed section 202(a)(9), pages 3 and 4 of S. 2202. This section authorizes the Secretary of Interior to work with the private sector in utilizing highly saline water for industrial purposes.

Industrial use of highly saline water would: One, allow greater use of the nonsaline waters by virtue of removing the concentrated saline pollutants from the system; two, reduce the pressure for industrial use of nonsaline waters; three, provide for long-term stable economic growth in the basin; four, minimize the cost of saline pollution control to the Federal and State governments.

I would briefly like to present the concept of one such saline water use that was developed from suggestions contained in the Bureau of Reclamation Report, "Saline Water Use and Disposal Opportunities" September 1981, and might be implemented under the authority of section 202(a)(9), if enacted.

This concept is called Aquatrain, the transport of encapsulated coal in a saline water pipeline. This concept envisions the construction of a 30-inch to 36-inch diameter pipeline from Northwestern Colorado to the Pacific Southwest—possibly the California coast—a distance of about 1,000 miles.

Coal mined in Colorado would feed the pipeline up to 15 to 20 million tons per year. Fresh water owned by W. R. Grace, about 12,000 acre feet per year, would be used to transport the coal from the mines in the vicinity of Craig, Colo., to Rifle, Colo., where it would be exchanged forwater containing up to 14,000 milligrams per liter of total dissolved solids, from the Glenwood/Dotsero Springs for transport to the Pacific coast.

The Glenwood/Dotsero Springs is the largest natural saline pollution source to the Colorado River. These dispersed springs contribute about 25,000 acre feet per year to the Colorado River or about 500,000 tons of salt per year.

Aquatrain would capture as much of this saline flow as possible, approximately 50 percent, and thus would remove about 250,000 tons of salt per year from the system.

This amount represents 10 percent of all the salt that must be removed in order for the United States to meet the established water quality standards and thus protect the integrity of its treaty obligations with Mexico.

The 12,000 acre-feet that would be diverted into the pipeline represents only 0.001 percent of the Colorado River flow.

Also, unlike slurry, the technology involved with Aquatrain when proven may be applicable to the transport of other high value bulk commodities such as mineral concentrates or agricultural products.

An initial economic and technological feasibility assessment of the Aquatrain pipeline has been made for W. R. Grace & Co. by the Colorado School of Mines Research Institute.

Project costs are estimated to be about $2 billion. We feel this capital investment for Aquatrain can be obtained from private sources based on transportation fees for moving the encapsulated coal product to market and Federal payments for the removal of salts from the Colorado River.

The Department of Interior has committed to as much participation as possible at this time. That is, the Department commitment to a joint study design phase with Grace for the Aquatrain planning effort.

We are seeking additional partners in this project, and are having numerous meetings with other coal companies, utilities, transportation and engineering companies.

The participation of U.S. utilities in this concept to consume the major part of "coal product" transported by Aquatrain is imperative to its success.

Now with respect to S. 2202, what private firms need for projects using highly saline water are: One, secretarial approval for such ventures; two, the option of Federal participation to assure that project design meets public purposes; three, the option of Federal participation in the project through saline credits; that is, financial participation that reflects the benefits to the Federal Government.

The Secretary should have flexibility in determining the form of such credits in order to assure the public objectives are met and also be relevant to the project.

Whatever the form of saline credits, we anticipate that Federal participation would be less than the government's costs of salinity control through the most cost-effective alternative technology that would otherwise be used, and such other benefits as might accrue to the Federal Government.

In addition, with rspect to the wording of section 202(a)(9), I suggest the Committee make clear that the user of the words "to demonstrate saline water use technology and to beneficially use and dispose of saline waters," line 1 and 2, page 4, S. 2202, refers to both full-scale saline water use projects as well as one-time, short-duration and small-scale efforts oriented toward proving that a particular saline water use technology can work.

Successful resolution of environmental issues related to a project of this scale depends on continuous and broadly based public participation in the planning process.

To this end, Grace and the Bureau of Reclamation have opted to involve the public and organized citizen groups in the early stages of the project.

We have met with major national and regional environmental groups on the Aquatrain concept. In conclusion, we think Aquatrain is a viable concept.

It is worth pursuing under the diverse objectives of: Salinity pollution control, development and conservation of mineral resources, meeting existing air quality standards, providing long-term fuel needs for new and existing powerplants, and increasing exports of coal derived products which will improve our balance of payment deficits.

We think it is necessary and timely for Congress to put the Federal Government on the track of joint project planning with industry, State, and citizens.

We therefore support S. 2202 and look forward to early enactment. Thank you.

Senator **Murkowski**. Thank you, Mr. McKeever.

[The prepared statement of Mr. McKeever follows:]

# PREPARED STATEMENT OF IRA E. MCKEEVER, PRESIDENT, WESTERN MINING OPERATION, W. R. GRACE & CO., DENVER, COLO.

## Introduction--S.2202

Good morning. I am Ira McKeever, President, Western Mining Operations, W. R. Grace & Co., Denver, Colorado.

My interest in being here this morning is to express support for S.2202, and specifically two concepts contained in these amendments: (1) encouragement of the industrial use of highly saline waters, and (2) the need to provide the option for joint public-private sector projects for the use of highly saline waters.

Today, I want to specifically address the proposed Section 202 (a)(9) (pages 3 & 4 of S.2202). This section authorizes the Secretary of Interior to work with the private sector in utilizing highly saline water for industrial purposes.

Industrial use of highly saline water would:

1. Allow greater use of the non-saline waters by virtue of removing the concentrated saline pollutants from the system.
2. Reduce the pressure for industrial use of non-saline waters.
3. Provide for long-term stable economic growth in the basin.
4. Minimize the cost of saline pollution control to the Federal and State governments.

I would briefly like to present the concept of one such saline water use that was developed from suggestions contained in the Bureau of Reclamation Report, "Saline Water Use and Disposal Opportunities" September 1981, and might be implemented under the authority of Sec. 202 (a)(9), if enacted.

**Aquatrain**

This concept is called Aquatrain: the transport of encapsulated coal in a saline water pipeline. This concept envisions the construction of a 30" to 36" diameter pipeline from northwestern Colorado to the Pacific Southwest (possibly the California coast) a distance of about 1,000 miles. Coal mined in Colorado would feed the pipeline with up to 15 to 20 million tons per year. Fresh water owned by W. R. Grace, about 12,000 acre feet per year, would be used to transport the coal from the mines in the vicinity of Craig, Colorado, to Rifle, Colorado, where it would be exchanged for water containing up to 14,000 mg/l of total dissolved solids, from the Glenwood/Dotsero Springs for transport to the Pacific coast.

The Glenwood/Dotsero Springs is the largest natural saline pollution source to the Colorado River. These dispersed springs contribute about 25,000 acre feet per year to the Colorado River or about 500,000 tons of salt per year. This source represents 18% of all salt entering the Colorado River System from sources identified in the September 1981 Bureau of Reclamation study, but only 4% of the identified saline flows in the basin.

Aquatrain would capture as much of this saline flow as possible, approximately 50%, and thus would remove about 250,000 tons of salt per year from the river. This amount represents 10% of all the salt that must be removed in order for the U. S. to meet the established water quality standards and thus protect the integrity of its treaty obligations with Mexico. The 12,000 acre feet that would be diverted into the pipeline represents only 0.001% of the Colorado River flow (see attached map: "Impact of Aquatrain Project on Quantity and Quality of Flow in Upper Colorado River Basin, April 1982").

The Aquatrain pipeline would differ dramatically from a coal slurry pipeline. The coal would be crushed and processed at the mine. The "coal product" would then be placed in plastic capsules. The capsules containing the "coal product" would have approximately the same specific gravity as the saline water which would transport them. Through the processing of the coal at the mine, a more uniform and higher grade "coal product" could be delivered direct to the power plant than through existing transportation means. After processing, the "coal product" would be stabilized in the capsule so that spontaneous combustion could not occur during transport and storage. It is envisioned that significant savings could be realized in the design of new power plants or in the retrofitting of existing oil burning plants through use of processed coal. Waste products from this coal processing would be consumed near the mine site through electric power generation and coal product preparation.

In addition, with a projected market for U. S. coal emerging in the Pacific Rim countries of Japan, Korea, and Taiwan for 10 to 20 million tons per year by 1990, a pipeline transport of Colorado coal to the Pacific seems feasible.

Since the number of coal capsules can be varied from time to time, this particular concept allows for the gradual buildup of coal shipments and for market fluctuations in the future. Also, it avoids problems associated with coal/saline water slurries that have not been resolved to date. The problems of the saline water leaching undesirable minerals out of the coal during transport (and thus adding to the water disposal problem) and saline materials being added to the coal which cannot be entirely removed before burning thus causing corrosion, slagging, and fouling during the combustion process, are avoided with this process.

Also unlike slurry, the technology involved with Aquatrain when proven may be applicable to the transport of other high value bulk commodities such as mineral concentrates or agricultural products.

An initial economic and techonological feasibility assessment of the Aquatrain pipeline has been made for W. R. Grace & Co. by the Colorado School of Mines Research Institute. Project costs are estimated to be about two billion dollars. We feel this capital investment for Aquatrain can be obtained from private sources based on transportation fees for moving the encapsulated coal product to market and Federal payments for the removal of salts from the Colorado River (see summary of CSMRI report attached).

In order for this project to move forward, formal cooperation with and participation by the Federal Government is necessary.

The Department of Interior has committed to as much participation as possible at this time. That is, the Department committment to a joint study design phase with Grace for the Aquatrain planning effort. (See attached letter from Under Secretary Hodel to McKeever, April 22, 1982).

We are seeking additional partners in this project, and are having numerous meetings with other coal companies, utilities, transportation and engineering companies. The participation of U. S. utilities in this concept to consume the major part of "coal product" transported by Aquatrain is imperative to its success.

## S.2202--Section 6, inserting subsection 202 (a)(9)

Now with respect to S.2202, what private firms need for projects using highly saline water are:

1. Secretarial approval for such ventures.
2. The option of Federal participation to assure that project design meets public purposes.
3. The option of Federal participation in the project through saline credits; that is financial participation that reflects the benefits to the Federal government.

The Secretary should have flexibility in determining the form of such credits in order to assure the public objectives are met and also be relevant to the project. Saline credits might take the form of:

1. Annual payments over the life of the project, or shorter period.
2. Financial participation in construction.
3. A combination of the above.

Whatever the form of saline credits, we anticipate that Federal participation would be less than the government's costs of salinity control through the most cost-effective alternative technology that would otherwise be used, and such other benefits as might accrue to the Federal government.

In addition, with respect to the wording of Section 202 (a)(9), I suggest the Committee make clear that the use of the words "to demonstrate saline water use technology and to beneficially use and dispose of saline waters" (line 1 and 2, pg.4, S.2202) refers to both full scale saline water use projects as well as one-time, short-duration and small scale efforts oriented toward proving that a particular saline water use technology can work.

## Role of States

There are numerous other issues that must be resolved for Aquatrain and other saline water use projects. For instance, the members of the Seven-State Salinity Control Forum must address the question of how saline water use projects having a pollution control component are to be treated under the terms of the Colorado River Compact with respect to depletion. Similarly, are provisions of State laws pertaining to export of potable (traditionally useful) water applicable to saline water?

Such questions are being addressed by the States (see attached letter from Myron Holburt to Commissioner Broadbent, February 9, 1982). Early resolution of these questions is essential to minimize the financial risk to both industry and government participants.

## The Environmental Community

Successful resolution of environmental issues related to a project of this scale, depends on continuous and broadly based public participation in the planning process.

To this end, Grace and the Bureau of Reclamation have opted to involve the public and organized citizen groups in the early stages of the project. We have met with major national and regional environmental groups on the Aquatrain concept.

Our initial meeting identified a number of concerns, including growth and project impacts in areas directly affecting national interest lands (National Parks, National Monuments, Wilderness Areas, etc.). Equally important though, these groups have indicated a willingness to participate in the planning of this project. I hasten to note though, that we recognize such participation does not condition their **respective organization's** freedom to independently assess and take action on this project during the regulatory review and subsequent phases.

## Conclusion

In conclusion, we think AQUATRAIN is a viable concept. It is worth pursuing under the diverse objectives of; salinity pollution control, development and conservation of mineral resources, meeting existing air quality standards, providing long-term fuel needs for new and existing power plants, and increasing exports of coal derived products which will improve our balance of payment deficits.

We think it is necessary and timely for Congress to put the Federal government on the track of joint project planning with industry, state, and citizens.

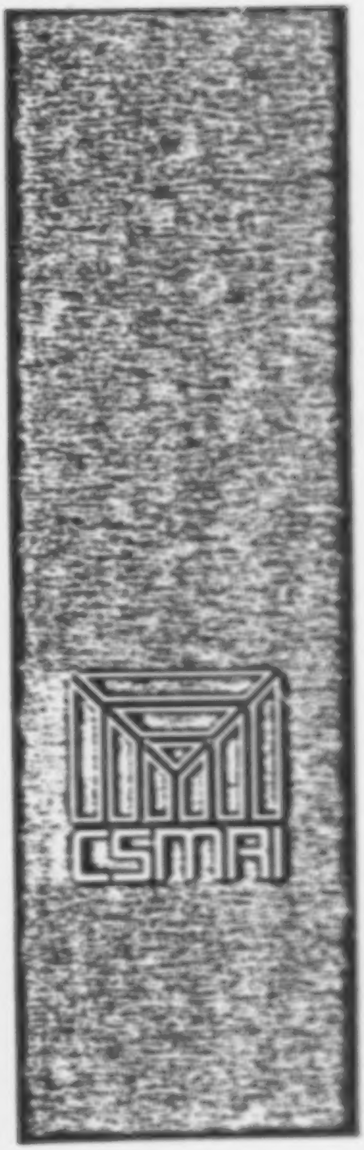
We therefore support S.2202 and look forward to early enactment.

Thank you.

## ATTACHMENTS

(materials filed for the record and to accompany the testimony of Ira McKeever)

1. Aquatrain Concept Paper.
2. Hodel Letter.
3. Holburt Letter.
4. Water Map...Upper Colorado River Basin.
5. Summary, CSMRI Report.
6. Grace Letter to Environmental Groups.



# MANAGEMENT SUMMARY

# HYDRAULIC DESIGN AND COST ESTIMATE
# FOR A
# COAL WATER CAPSULE PIPELINE

W. R. GRACE AND COMPANY

Colorado School of Mines Research Institute

COLORADO SCHOOL OF MINES RESEARCH INSTITUTE

# HYDRAULIC DESIGN AND COST ESTIMATE FOR A COAL WATER CAPSULE PIPELINE

Prepared for

W.R. Grace and Company
Natural Resources Group
3333 Quebec Street
Suite 8800
Denver, CO 80207

By

Colorado School of Mines Research Institute
Golden, Colorado 80402

Project C10725

January 19, 1982

James M Link

James M. Link
Director
Exploration & Mining Division

Robert L. Griffis

Robert L. Griffis
Project Engineer
Energy Division

R.R. Faddick

R. R. Faddick, Ph.D.
Slurry Transport Specialist
Exploration & Mining Division

MANAGEMENT SUMMARY

## INTRODUCTION

In July of 1981, Mr. Ira E. McKeever, Jr., President of Western Mining Operations for W.R. Grace and Company, contacted Mr. J.M. Link of Colorado School of Mines Research Institute to discuss a feasibility study for a coal slurry pipeline. After several discussions, a proposal for the study was submitted by Mr. Link on August 24, 1981. Work was authorized by Mr. McKeever on August 26, and began almost immediately.

The system design was based upon the discussions between Mr. Link and Mr. McKeever at the Research Institute on August 13, 1981. Briefly, brackish or salt water obtained from wells in the Piceance Basin, from the federal desalinization station to be built near Rifle, Colorado, or other sources will be used as the carrier. Neutrally buoyant capsules of coal contained in plastic bags will be preparaed at Axial and injected into the pipeline. The pipeline route would be from Axial, Colorado to Oxnard, California via Rifle and Grand Junction, Colorado and the Kaiparowits Plateau. This route was adjusted to suit terrain features as shown on Army Map Service 2 degree sheets. Pipe diameter and wall thicknesses, as well as pump station locations, were defined on the basis of the terrain and predicted power requirements.

Capsule friction losses were computed from test data reported by various investigators. For the most part, these data were from smaller pipes and were scaled to the size proposed for this system.

The size distribution of the coal to be encapsulated and the specific gravity of the capsules was based on limited experimental work conducted at the Institute. For this work three 35-gallon drums of coal were provided from the Colowyo mine at Axial.

The conceptual design for the capsule pipeline will transport 10 to 15 million tons of coal capsules to the West Coast annually. Because of the lack of certainty regarding the availability of novel equipment, no refined cost estimates were prepared. However, descriptions of the pipeline, route, pipe and pump station requirements, and associated cost estimates were prepared.

## SUMMARY AND CONCLUSIONS

This report presents the logic behind the conceptual design of a coal capsule pipeline connecting Axial, Colorado and Oxnard California. The route selected is 967 miles long and the system will transport 10 to 15 million tons of dry coal annually.

The pipeline itself is a conventional 30-in. slurry type of pipeline. It is constructed of high-strength welded steel pipe and is coated and wrapped externally and is buried at least 3 feet below the ground surface.

The pipe is also coated on the inside with a 30 mil coating of plastic or epoxy resin. This is done so that the corrosive water used will not attack the steel. The coating will also ensure a smooth interior surface so that the capsules will not be torn or otherwise damaged in transit.

The water used to transport the capsules from Axial to Rifle, Colorado will be freshwater from the Yampa River. At Rifle, this water will be dumped into the Colorado River and saline water from the Glenwood Springs-Dotsero area will replace it. At the west coast, the saline water will be discharged into the Pacific Ocean. While no chemical data were obtained in the course of this study, the saline water reportedly has about half the dissolved solids of seawater. Further chemical analyses will be required to assess the potential for environmental damage, if any.

Coal from the Axial area will be crushed to pass ¼ inch and then dried. Following the drying, the coal will be packed into a heavy duty plastic tube to form the capsules. Each capsule will be about 12.5 feet long and 2.1 feet in diameter, and will contain approximately 1.4 tons of coal. Packing of the coal will be controlled so that the capsules have the same bulk density as the saline water.

While the report assumes individual capsules, the concept of long trains of capsules (Aquatrain) produced by a continuous manufacturing process has great appeal. By connecting the capsules, the 6 foot spacing between capsules, assumed in the design portion of this study, could be reduced to a foot or less. The increased volumetric efficiency of the pipeline could be used to transport additional coal at virtually no cost.

Because of the terrain, pipeline pump stations would be of two kinds. At several points along the pipeline, pressure input into the system would be required. This would be accomplished by forcing a single capsule, or a train of capsules, into a fluid-filled pipe by means of pumping water through the pipe at high volumes and low pressures. When the capsule is in the pipe, valves close to isolate the segment from the low pressure side of the system and other valves open to connect the segment to the main pipeline. High pressure water then forces the capsule out into the pipeline and it joins the transport flow. This process is repeated to inject a steady stream of capsules or trains of capsules into the system.

At several places, pipeline pressures become excessive and pressure must be removed from the system. The same type of system described above would be used for the purpose, but the sequence of operations would be reversed to reduce pressure.

A unique situation exists at Rifle where the capsules must pass into the pipe segment, the water must drain out, and it must be replaced by high pressure saline water. The same type of pump system would be used at Rifle, but valving and other mechanisms would be more complex.

Capsule recovery would be by discharge into a large launder. Capsules would flow down the open channel and would move onto a slack wire conveyor belt. The belt would support the capsules to prevent breakage and would allow the water to drain off. A fresh water spray would remove any residual salts from the surface of the capsule.

Once on the conveyor belt, the coal capsules could be emptied and the coal would be handled in a conventional manner. As an alternative, the capsules could be loaded directly onto ships for export. Separation of the coal and capsule would then be handled by the customer.

The capital cost estimate for what appears to be the best pipeline system, pumps, and so forth is 1,604.81 million 1981 dollars. This figure does not include capsule manufacturing, capsule recovery, or terminal facilities at Oxnard.

Annual operating costs for the system moving 15 million tons estimated to be:

| | $/yr | $/ton |
|---|---|---|
| Labor and Supervision | $ 1,778,540 | $ 0.119 |
| Materials and Supplies | 14,544,000 | 0.970 |
| Utilities | 29,884,000 | 1.992 |
| Labor and Other Overhead | 1,287,500 | 0.086 |
| Subtotal | $ 47,495,040 | $ 3.166 |
| Depreciation | 45,597,000 | 3.040 |
| Property Taxes | 4,154,000 | 0.277 |
| Insurance | 6,066,000 | 0.404 |
| Finance Charge | 104,626,600 | 6.975 |
| Subtotal | $160,443,600 | $10.696 |
| Total | $207,938,640 | $13,862 |

At 10 million tons per year the estimated cost is about $19 per ton of coal delivered.

## RECOMMENDATIONS

Construction and operation of a capsule pipeline system of the size described in this study has never been attempted. Therefore, a prudent approach would be based on substantial research and test work. Such work would provide the hard data required to engineer the successful system.

The area of most immediate concern is capsule design and construction. A test program designed to identify the best plastic and capsule manufacturing process would be a logical first step.

Handling of the capsules at either end of the pipeline might be done by conventional means. Therefore, a capsule capable of surviving a modest amount of rolling, lifting, stacking, and so forth would be desirable. Capsules could be fabricated by hand and subjected to a series of tests to determine their resistance to such abuse.

A second series of tests could be conducted by subjecting the capsules to pressures up to 5,000 pounds per square inch. These tests would be conducted to determine the resistance of the capsule to perforation by the sharp edges of the coal particles.

Another series of tests would deal with the resistance to abrasion of the capsule material. The capsules could be placed in a water-filled tank and rubbed with a large diameter wheel of the same or similar material. The number of hours required to create holes in the bag would be recorded as would the test conditions.

A second area requiring substantial effort will be the pump stations. Perhaps the best method to approach this problem would be the construction of a full scale test loop. The full size test facility is recommended because the research work to date has been performed in pipes of relatively small size. Capsules of the selected material could then be passed through the pumps a number of times, and the effects on the capsule of rapid pressure changes, starting and stopping, bumping, and so forth, could be determined.

The test loop would also allow the design, testing, and evaluation of the large number of devices available for pumping capsules. Prior to the test work a thorough international literature search should be conducted. Perhaps manufacturers could be interested in participating in the test work to prove or improve their devices.

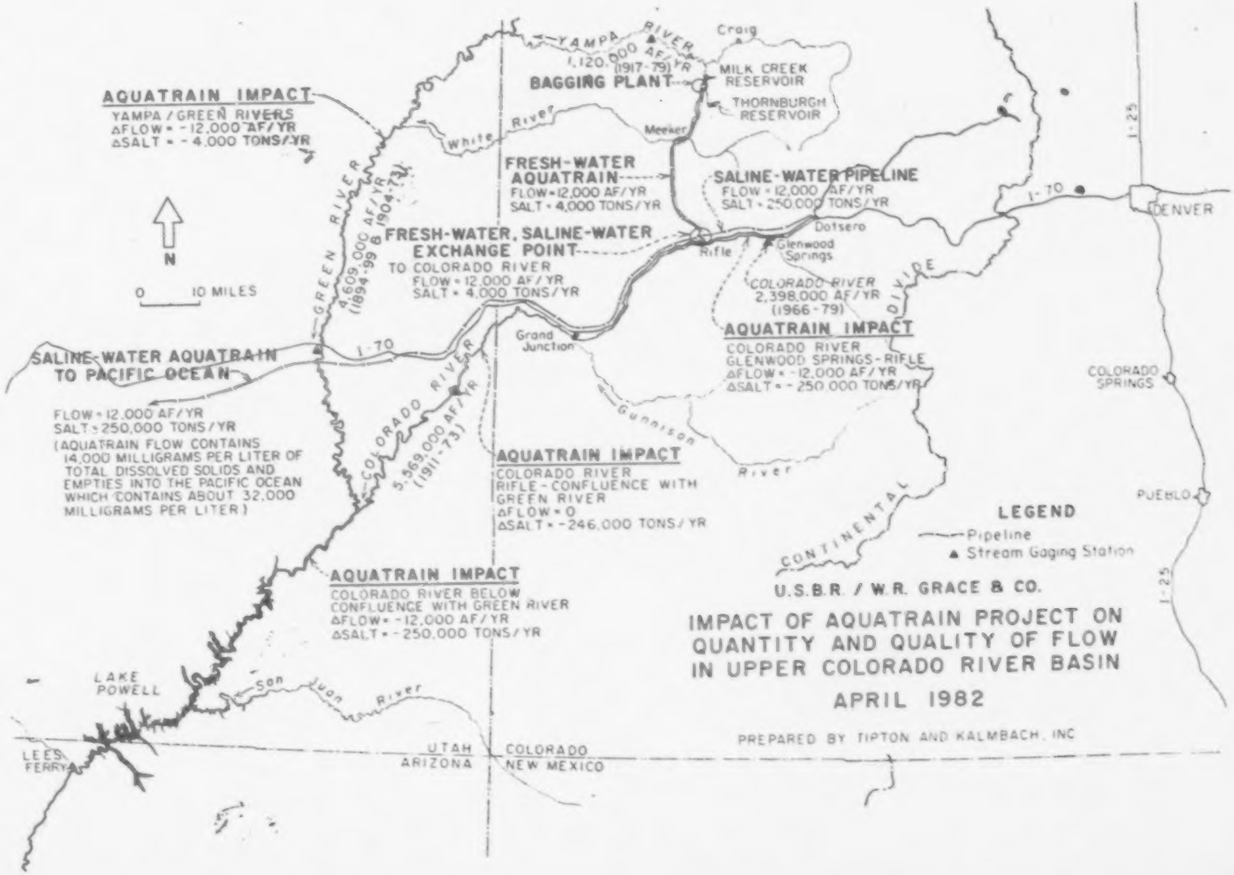
An in-depth route study and detailed survey should be conducted. This might allow the selection of an improved location for the pipeline. Also, the willingness of the city of Oxnard or any other city to provide the port should be examined.

A detailed analysis of ship loading and market requirements is needed. Such things as coal quality and market requirements, spontaneous combustion or explosion potential, and other similar factors must be evaluated. If a dried coal is to be shipped, the capsules must be loaded and unloaded from the ship. Whether and how this is done will require a thorough investigation of both capsule handling equipment and related port requirements.

Finally, a thorough and comprehensive analysis of the potential environmental, governmental, and other impacts must be made. This analysis should include the methods and degree of interfacing of the proposed pipeline and the proposed federal desalinization program.

The concept is a good one, but the successful operation of the system will require a market for 10 to 15 million tons of coal per year. Therefore, the potential customers for the coal must be identified early and their participation in the project obtained.

A further potential for the manufacture and marketing of the capsule pipeline concept exists. If the utility of the concept can be demonstrated, applications outside of W.R. Grace and Company should be sought.



U.S.B.R. / W.R. GRACE & CO.

IMPACT OF AQUATRAIN PROJECT ON QUANTITY AND QUALITY OF FLOW IN UPPER COLORADO RIVER BASIN

APRIL 1982

PREPARED BY TIPTON AND KALMBACH, INC

AQUATRAIN IMPACT
YAMPA / GREEN RIVERS
ΔFLOW = -12,000 AF/YR
ΔSALT = -4,000 TONS/YR
N
0 10 MILES
SALINE-WATER AQUATRAIN TO PACIFIC OCEAN
FLOW = 12,000 AF/YR
SALT = 250,000 TONS/YR
(AQUATRAIN FLOW CONTAINS 14,000 MILLIGRAMS PER LITER OF TOTAL DISSOLVED SOLIDS AND EMPTIES INTO THE PACIFIC OCEAN WHICH CONTAINS ABOUT 32,000 MILLIGRAMS PER LITER)
GREEN RIVER
4,609,000 AF/YR (1894-99 & 1904-73)
YAMPA RIVER
1,120,000 AF/YR (1917-79)
Craig
MILK CREEK RESERVOIR
THORNBURGH RESERVOIR
BAGGING PLANT
White River
Meeker
FRESH-WATER AQUATRAIN
FLOW = 12,000 AF/YR
SALT = 4,000 TONS/YR
FRESH-WATER, SALINE-WATER EXCHANGE POINT
TO COLORADO RIVER
FLOW = 12,000 AF/YR
SALT = 4,000 TONS/YR
SALINE-WATER PIPELINE
FLOW = 12,000 AF/YR
SALT = 250,000 TONS/YR
Dotsero
Rifle
Glenwood Springs
I-70
DENVER
I-25
COLORADO RIVER
2,398,000 AF/YR
(1966-79)
DIVIDE
AQUATRAIN IMPACT
COLORADO RIVER
GLENWOOD SPRINGS-RIFLE
ΔFLOW = -12,000 AF/YR
ΔSALT = -250,000 TONS/YR
Grand Junction
COLORADO RIVER
5,569,000 AF/YR (1911-73)
Gunnison River
AQUATRAIN IMPACT
COLORADO RIVER
RIFLE-CONFLUENCE WITH GREEN RIVER
ΔFLOW = 0
ΔSALT = -246,000 TONS/YR
COLORADO SPRINGS
PUEBLO
CONTINENTAL
LEGEND
Pipeline
▲ Stream Gaging Station
AQUATRAIN IMPACT
COLORADO RIVER BELOW CONFLUENCE WITH GREEN RIVER
ΔFLOW = -12,000 AF/YR
ΔSALT = -250,000 TONS/YR
LAKE POWELL
San Juan River
LEES FERRY
UTAH
ARIZONA
COLORADO
NEW MEXICO

United States Department of the Interior
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

APR 2 2 1982

Mr. Ira E. McKeever, Jr.
President, Western Mining Operations
W. R. Grace & Co.
Stapleton Plaza
3333 Quebec Street, Suite 8800
Denver, CO 80207

Dear Mr. McKeever:

Representatives of the Department of the Interior enjoyed meeting with you and other representatives of the W. R. Grace & Co. on March 26, 1982. The AQUATRAIN concept for using saline water developed by the Colorado River Water Quality Improvement Program as the transport media for a coal capsule pipeline appears to offer significant potential from a Federal perspective.

The Department of the Interior is prepared to work with the Colorado River Basin States, W. R. Grace & Co., and other public and private interests in the initial phase of this undertaking. That initial phase will include development of a plan of study and arrangements for Federal/non-Federal financing of feasibility and environmental analyses. In that regard, I am asking the Bureau of Reclamation to take the lead role in these activities, utilizing the capabilities of the Bureau of Land Management and the Office of the Solicitor as appropriate. Pending appointment of a team leader from Reclamation, please continue to work with Mr. Michael J. Clinton, Chief, Colorado River Water Quality Office, Bureau of Reclamation, Denver, Colorado. Utilizing existing authorities, available personnel, and presently budgeted funds, the Department of the Interior will take the following actions.

- Completion of an appraisal level-study of coal transport systems and alternatives (now underway).
- Establish and fund a team of Interior Department specialists to assist in program execution.
- Assist W. R. Grace & Co. and the Colorado River Basin Salinity Control Forum in seeking the participation of coal users (utilities, foreign and domestic), transportation companies, coal suppliers, and other private interests. In this regard, Reclamation will publish an official notice of investigation seeking such participation.

Although enabling legislation (S. 2202) has been introduced, passage will be necessary for us to participate in feasibility studies and possible construction. Assuming that enabling legislation is enacted and necessary resources of personnel and funding are available, the Department of the Interior is prepared to support the endeavor in the following ways:

- Act as contracting officer for necessary feasibility and environmental studies (Federal financial participation in these studies to be a minor part) as determined prior to study initiation.

- Participate in project financing and implementation to the extent that the Federal interest can be supported.

We understand that W. R. Grace & Co. will assume the lead role for coal transport technology development and formation of a consortium of private sector interests to participate in the venture and to finance the non-Federal share of the costs. We also understand that the Colorado River Basin Salinity Control Forum and the respective States will assume the lead role relating to water rights issues and other related concepts that are matters of State rather than Federal jurisdiction. Continued State participation is essential because of repayment requirements in the Colorado River Basin Salinity Control Act (Public Law 93-320).

In summary, we in the Department of the Interior are fully supportive of the AQUATRAIN proposal and feel that such joint ventures between industry and Government may prove to be mutually beneficial. We look forward to continuing to work with W. R. Grace & Co. and others to make beneficial use of the saline waters of the Colorado River.

Sincerely,

Donald Paul Hodel

UNDER SECRETARY

cc: Mr. Jack A. Barnett
Executive Director
Colorado River Basin Salinity Control Forum
220 South 200 East, Suite 320
Salt Lake City, UT

EXAMPLE

W. R. GRACE & CO
NATURAL RESOURCES GROUP
STAPLETON PLAZA
3333 QUEBEC STREET, SUITE 8800
DENVER, COLORADO 80207
(303) 399-0779

IRA E. MCKEEVER, JR., PRESIDENT
WESTERN MINING OPERATIONS

April 14, 1982

Mr. Michael Scott
Field Representative
The Wilderness Society
1720 Race Street
Denver, Colorado 80206

Dear Mr. Scott:

Over the past six months, W. R. Grace & Co. has been initially exploring the feasibility of a combined saline water/coal capsule pipeline transport system from Colorado to the West Coast.

Such a system would involve the cooperative efforts of the seven member states of the Colorado River Salinity Control Forum and the Department of Interior. This system would use naturally occurring saline water that is now contributing to the reduction in the quality and uses of the Colorado River.

Our initial work is sufficiently encouraging to warrant the preparation of a comprehensive study program for the project.

Part of such an effort is making sure that the concerns and interests of environmental groups are identified at an early stage and adequately addressed throughout the planning and design stages.

To initiate this process, I invite you to a meeting for a presentation and review of the work to date. This will be held here in our offices on Friday, May 21, starting at 9:00 a.m. I hope that we can obtain your initial reaction to and comments on the project concept during this meeting. We would also hope to establish a process for continual communication throughout the development of the study program. This process would continue if the program is undertaken.

I understand, of course, that your decision to actively participate in such a process does not condition your organization's freedom to independently assess and take action on this project during the regulatory review and subsequent phases.

We met with Under Secretary Hodel and other Interior officials on March 26 and the Department is sufficiently interested to proceed with a planning phase. I understand a notice to this effect will be published soon in the Federal Register.

We hope that the following governmental officials will be at this meeting: Mike Clinton and Mike Bessler of the Colorado River Water Quality Improvement Program, Bureau of Reclamation; and Jack Barnett of the Colorado River Basin Salinity Control Forum.

Please find enclosed a packet of materials that more fully describe the project and reflect the progress made to date.

Also enclosed is a list of individuals (and groups) to whom this information and materials are being sent. Please let us know if others should be invited to the May 21 meeting.

Please call me or Elizabeth Sturges-Murray if there are any questions or to confirm arrangements. I look forward to seeing you on May 21 and developing a fruitful working relationship on this project.

Sincerely,

Ira E. McKeever, Jr., President
Western Mining Operations

dh

Enclosures

## ENCLOSURES

1. Individuals to whom this letter is being sent, April 16, 1982.

2. W. R. Grace concept paper, November 24, 1981.

3. Publications of the Colorado Water Quality Improvement Program, Bureau of Reclamation.
   - *a) Executive summary, "Saline Water Use and Disposal Opportunities".
   - b) "Colorado River: Water Quality Improvement Program".
   - c) "Salinity Update", October 1981 and January 1982.

4. Rocky Mountain News article dated Sunday, February 7, 1982.

5. The Daily Press article dated Friday, March 6, 1982.

*6. Management summary from the Colorado School of Mines Research Institute on "Hydraulic Design and Cost Estimate for a Coal Water Capsule Pipeline".

*7. Executive Summary from Chinook Fuel Innovations Ltd. on "An Assessment of the use of Flexible Skin Capsules for Long Distance Coal Transport".

*8. Executive Summary regulatory review from ERT (Environmental Research & Technology, Inc.) on "Coal Transportation Pipeline".

9. Letter from Mr. Myron B. Holburt, Chief Engineer, Colorado River Board of California, to Commissioner Broadbent; dated February 9, 1982.

10. Letter from Mr. J. William McDonald, Director, Colorado Water Conservation Board, Department of Natural Resources, dated March 9, 1982.

11. U. S. Department of Interior (Bureau of Reclamation)/W. R. Grace et al memo dated March 23, 1982.

*Copies of these entire reports along with W. R. Grace Annual and Special Group Reports are available on request and will be at the May 21 meeting.

Revised 6/22/82

## CONCEPT PAPER

SUBJECT: A pipeline unique to the Colorado River drainage area for transporting coal contained in disposable plastic capsules and thus completely separated from the saline water medium used to obtain neutral buoyancy of the coal container.

The Salinity Control Forum has grappled for many years with the problems of excessive total dissolved solids in the Colorado River, and we in the coal industry have been struggling to remain competitive in the face of rapidly escalating rail rates. I would like to offer you an idea that we at W. R. Grace & Co. are working on that could partially solve both of these problems.

An unusual opportunity exists in the Colorado River basin for transporting coal via pipeline to the Pacific Coast and in the process disposing of some of the Colorado River's total dissolved solids problem. The project envisions the cooperation of Federal, State, local, public, and industrial entities to remove about 10% of the salts currently entering the Colorado River and to pass this saline water through a pipeline to the Pacific Ocean. We feel the capital investment for the pipeline could be obtained from private sources based on federal payments for removal of salts from the Colorado River and transportation fees for encapsulated coal to market.

A 30 to 36-inch diameter pipeline would be constructed from a point near Axial, Colorado, to a point yet to be ascertained on the California Pacific Coast, a distance of about 1,000 plus miles. Coal mined in Colorado would feed the pipeline with up to 15 to 20 million tons per year. Fresh water owned by

W. R. Grace & Co., about 12,000 acre feet per year, could be used to transport part of the coal from Axial to a point near Rifle, Colorado where it would be exchanged for water containing up to 14,000 milligrams per liter of total dissolved solids from the Glenwood/Dotsero Springs for transport to the Pacific Ocean.

The Bureau of Reclamation has been charged by federal law with the responsibility to reduce salt content of the Colorado River, as measured at the Imperial Dam in Arizona, to the 1972 level. This calls for 2.8 million tons of salt removal from the drainage system of the Colorado River by the year 2000. The proposed saline water/coal capsule pipeline project would remove an estimated 250,000 tons of salt per year of the required amount.

This pipeline would differ dramatically from a coal slurry pipeline. The coal would be crushed, cleaned, and dried at the mine. It would then be placed in a plastic capsule ("baggie"). The capsules containing the coal would have a specific gravity equal to the saline water which would transport them to the Pacific.

The process of transporting coal in plastic capsules was patented and has been researched by the Alberta Research Institute a few years ago. The capsules that were used to carry the coal after emptying could be recycled at the final destination point and the reclaimed material reused in the fabrication of new capsules. Since the coal is cleaned, crushed, and dried before shipment, a more uniform and higher grade coal could be delivered direct to the power plant than through existing transportation means. Moisture, sulphur, and ash content would be reduced prior to encapsulation and the coal stabilized in the capsule so that spontaneous combustion could not occur during transport and storage. Significant savings could be realized in the design of new power plants versus the use of coal transported in a saline water slurry. In addition, the benefits of removing highly saline water from the Colorado River basin could be substantial.

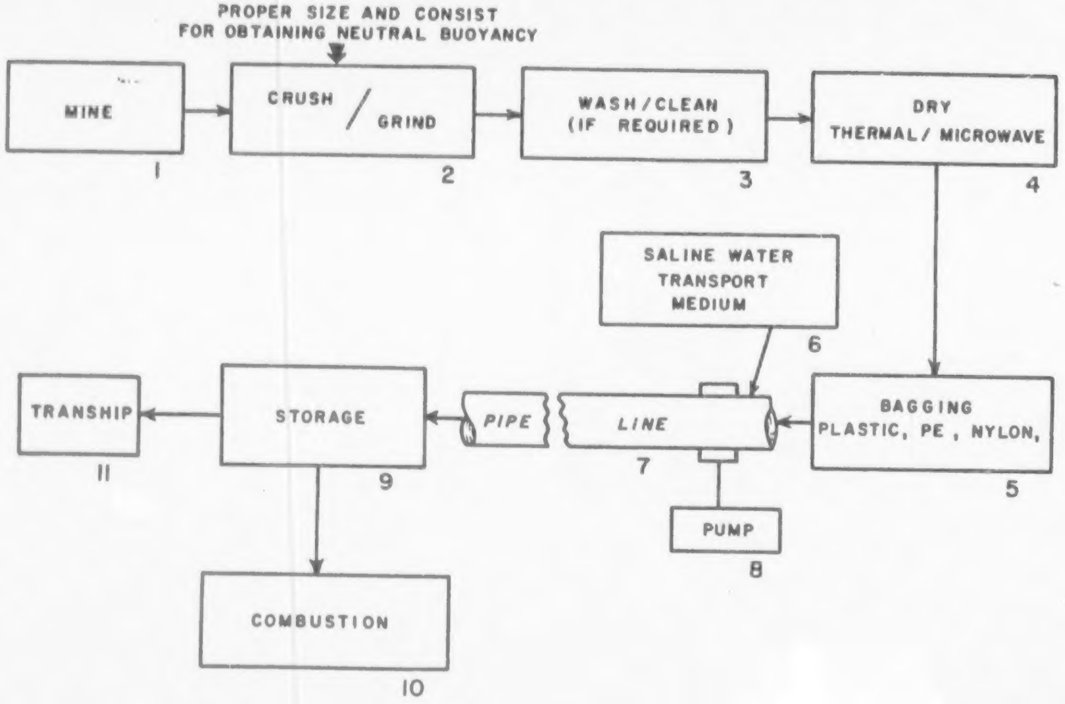
The seven Colorado River basin states will need to review their existing water laws for such a project to be possible. One reason this analysis has been delayed in the past is because no viable means of transporting coal and/or water containing high amounts of dissolved solids has been available. Now with a market for U.S. coal emerging in the Pacific Rim countries of Japan, Korea, and Taiwan for 10 to 20 million tons of coal per year by 1990, a pipeline transport of Colorado coal seems feasible. Since the number of coal capsules can be varied from time to time, this particular concept allows for the gradual buildup of coal shipments and for market fluctuations in the future. Also, it avoids problems associated with coal/saline water slurries that have not been resolved to date. The problems of the saline water leaching undesirable minerals out of the coal during transport (and thus adding to water disposal problems) and saline materials being added to the coal which cannot be entirely removed before burning thus causing corrosion, slagging, and fouling during the combustion process, are resolved with this process.

Research is continuing within W. R. Grace & Co., and with outside consultants. The financing of the pipeline is being discussed with Lazard Freres and Co. of New York. We will prepare two slide/tape presentations, 1) on the technical aspects of the concept and 2) on the financial aspects.

Prepared by Ira E. McKeever, Jr., President, Western Mining Operations, W. R. Grace & Co., Natural Resources Group, Stapleton Plaza, 3333 Quebec Street, Suite 8800, Denver, Colorado, 80207, (303) 399-0779.

# ENCAPSULATED COAL TRANSPORTATION SYSTEM

## SALINE WATER TRANSPORT MEDIUM


PROPER SIZE AND CONSIST
FOR OBTAINING NEUTRAL BUOYANCY
MINE
1
CRUSH / GRIND
2
WASH/CLEAN (IF REQUIRED)
3
DRY THERMAL/ MICROWAVE
4
BAGGING PLASTIC, PE, NYLON,
5
SALINE WATER TRANSPORT MEDIUM
6
LINE
PIPE
7
PUMP
8
STORAGE
9
COMBUSTION
10
TRANSHIP
11

W R GRACE & CO
FIRST REVISION
10/26/81-SB

STATE OF CALIFORNIA—THE RESOURCES AGENCY
EDMUND G. BROWN JR., Governor

COLORADO RIVER BOARD OF CALIFORNIA
107 SOUTH BROADWAY, ROOM 8103
LOS ANGELES, CALIFORNIA 90012
(213) 620-4480

February 9, 1982

RECEIVED
FEB 11 1982

Mr. Robert Broadbent, Commissioner
U. S. Bureau of Reclamation
Interior Office Building
Washington, D. C. 20240

Dear Bob:

At the October 27, 1981 meeting of the Colorado River Basin Salinity Control Forum, the Forum's Work Group was asked to investigate the proposal by W. R. Grace Company for a coal water capsule pipeline. The Work Group had an opportunity to hear a presentation by W. R. Grace Company at its February 2, 1982 meeting. The members found the proposal sufficiently interesting to give it further consideration and study. The proposal offers the potential of disposing of about 10 percent of the total salt load which needs to be removed from the river to maintain the numeric criteria for salinity in the lower mainstem. The proposal is consistent with the Forum's policy calling for the use of saline water and the Bureau of Reclamation's recent report on the use of saline water by industry.

We recognize that the proposal presents many questions with respect to water rights and water policy issues, economics, environmental impacts, and technical feasibility. We have formed a subcommittee to evaluate the issues which relate to state water rights and water policy.

We would like the Bureau of Reclamation to evaluate the impact of the Company's proposal on the overall salinity control program and the degree of federal participation in such a program. It would also be helpful if the Bureau, in cooperation with the Bureau of Land Management, would evaluate the environmental impacts. Finally, we recommend that the Bureau of Reclamation coordinate the federal government's activities with respect to the W. R. Grace proposal.

Sincerely,

Myron

Myron B. Holburt
Chief Engineer

cc: Members, Salinity Control Forum
Work Group
Ira McKeever, W. R. Grace Company

Senator **MURKOWSKI**. I assume that the high content of salt prohibits the utilization of the slurry concept in what you are talking about.

Mr. **McKEEVER**. Sir, I think there are two problems: One of salt contamination of the coal itself, which is possible, but it is costly and undesirable, and the second thing is on a long-term transport of saline water and coal finely mixed.

I think there is a possibility of dissolving some of the undesirables into the salt water which, upon disposal, can create environmental problems.

Senator **MURKOWSKI**. Is W. R. Grace interested in the salinity problem or are you involved in other methods?

Mr. **McKEEVER**. This is the main interest we are involved in.

Senator **MURKOWSKI**. Your chemical expertise is not directed to any of the concerns with salinity in this Colorado River?

Mr. **McKEEVER**. Well, we would, of course, be interested in the plastic capsule formation and the design of such.

Senator **MURKOWSKI**. How big a pipe would you propose?

Mr. **McKEEVER**. We feel that the economics dictate that at a bare minimum of 10 million tons a year would be the minimum.

That would require at least 30 inch diameter pipe.

Senator **MURKOWSKI**. How large are these plastic capsules?

Mr. **McKEEVER**. The plastic capsules in the 30 inch would be 2 feet diameter to 10 feet long. These are the rules of thumb we have learned from our research.

Senator **MURKOWSKI**. Are these difficult to load or is it an automatic process?

Mr. **McKEEVER**. It would be totally automatic. It would be taking existing technologies as are being used by source manufacturers at this time.

It would be scaled and sized. Certain technology would have to be developed.

Senator **MURKOWSKI**. Would you need significant horsepower to move that mass?

Mr. **McKEEVER**. We feel the consumption of horsepower may be less than the conventional slurry type of line. There is technology on how you input that horsepower to overcome friction losses along the line, but there are some thoughts as to how this can be accomplished.

Senator **MURKOWSKI**. What happens if you have to go over a range of hills and mountains? Just put more horsepower?

Mr. **McKEEVER**. This is a matter of energy input and also recapturing energy on the downhill side.

Senator **MURKOWSKI**. What is the attitude of the State of Colorado about moving water out of that State?

Mr. **McKEEVER**. I am not really free to be a good witness from that standpoint, but I think that this could be the concept that will allow that to take place.

Senator **MURKOWSKI**. Why specifically?

Mr. **McKEEVER**. I think that there are benefits from the removal of the saline water from that high up in the river system that accrued not only to the State of Colorado but everyone else.

Senator **MURKOWSKI**. So that you pick up that saline, high concentrations of saline, at Craig or Rifle, Colo.

Mr. McKeever. We would pick up the saline water at Rifle and interchange main water into the stem at Rifle.

Senator Murkowski. This 12,000 acre-feet, this is privately owned water that W. R. Grace has?

Mr. McKeever. Yes, through our development of coal reserves in northwest Colorado and the acquisition of various ranches in that area.

We acquired certain water rights.

Senator Murkowski. Is that an average capacity utilization figure?

Mr. McKeever. Well, as we envision this, the water would be collected from the Mill Creek portion running into Yampa or for water rights from the pump situation out of the Yampa River that we now own.

Senator Murkowski. Where is the water going now?

Mr. McKeever. It runs into the Yampa and into the Green and into the Colorado in Utah. It would be a diversion from one portion to the other.

Senator Murkowski. Have you got an estimate of the cost?

Mr. McKeever. It is over $2 billion.

Senator Murkowski. $2 billion?

Mr. McKeever. Over $2 billion.

Senator Murkowski. Well, I assume that your firm contends that the economics are there.

Mr. McKeever. Well, from the attachment, they have a thought that the cost of transporting coal in 1981 dollars would be about $19 a ton.

Apparently, our freight rates are in the order of $19, $27 to $28 for the same. We recognize this is a concept.

We recognize there is a lot of technology to be developed and that those are very loose numbers, but it does give us some encouragement that there is an alternate.

Senator Murkowski. Having had some experience with pipelines and the magnitude of the costs associated with them.

Someone proposed the Alaska oil pipeline would come in at about $1 billion. It came in at about $7 and $8. The cost of extensive governmental requirements associated with a lack of total feasibility study necessitated about $2 billion in excess of that originally estimated in the form of studies and various other questions that needed answering.

And then, of course, up until a short time ago, the gas pipeline, the costs associated with that, were finally determined to be in the neighborhood of $40 billion.

That was shelved temporarily, but I do appreciate and commend your company for proceeding with something that obviously would have a twofold benefit of a significant nature, which would solve the concern of the salinity problem we are discussing today.

And I do hope that the economics favors the development of it because it would be a major contributor.

Mr. McKeever. Thank you.

Senator Murkowski. The next witness will be Mr. Clayton Smith, Solar Energy Research Institute, Golden, Colo.

## STATEMENT OF DR. CLAYTON S. SMITH, SOLAR ENERGY RESEARCH INSTITUTE, GOLDEN, COLO.

Dr. SMITH. Thank you. I appreciate the opportunity to appear before you today. I have prepared a written statement, and I hope to just paraphrase a few points.

Senator MURKOWSKI. It will be so noted in the record.

Dr. SMITH. I would like to suggest a few possible uses for the saline water that may be able to develop beneficial uses for the water and also be economically attractive.

One area we have been involved with in our research is the production of microalgae. Microalgae are microscopic organisms most easily described as the simplest form of plant, though they do conduct photosynthesis to convert water and carbon dioxide into plant material.

They are a most unusual class of organism in that they can exist in the hot springs and in the desert and so forth. Due to this diversity they are extremely interesting chemically.

They also happen to be very effective converters of $CO_2$ and sunlight into plant material. Some of the best industrial plants have demonstration on small field experiments of about 60 to 80 tons per acre per year.

The most interesting species do thrive in highly saline waters and, therefore, they are good candidates for use of the saline water from the control system.

I have got a few pictures which are not part of the testimony that I could relay. This is a photomicrograph of one species of microalgae.

You see, the yellow parts are really oil, and the other colors are really protein. Here is another picture that actually shows the oil, very large quantities of oil can be produced from microalgae and be expressed out by squeezing.

I have two more photographs that I will make available hat show a field test plot that we have operated at the University of Hawaii that actually show a system.

The overall research has shown a number of points which during the testimony I will read those out. We have demonstrated yields of over 60 tons per acre per year in small outdoor systems.

Some species can produce up to 90 percent of the total product in oil. A variety of products may be produced, depending on species and cultivation methods. Typically, it is a high grade vegetable oil that would compete in the market with cottonseed and linseed oil and sunflower oil.

There are a very large variety of products that can be produced, but if you take the one species that we have done most R&D on, we can select, for instance, three products:

One would be an animal protein feed, another would be the oil, and the third might be some specialty of some sort. It is very easy to arrive at numbers of over $20,000 per acre per year.

It is also possible to get much higher numbers. Our researchers have identified what the requirements are for producing that.

Many of the species will grow in extremely concentrated salt solutions, and nearly all the species will concentrate nutrients found in saline waters.

One of the interesting aspects is that the microalgae do require amounts of carbon dioxide, which can be obtained from the water, from the atmosphere or, an interesting opportunity, from the large amounts of $CO_2$ in stack gases in coal-fired plants.

The stack gases would be excellent for feeding microalgae production. There is another opportunity that has been suggested in studies by the Bureau of Reclamation is the use of salt gradient solar ponds.

Such ponds use concentrated salt brines to collect solar energy efficiently. It has been demonstrated commercially on a small scale, and I can see some opportunities to blend salt gradient technology perhaps with microalgae production.

And generally that is the summary of the opportunities. I will be glad to answer questions.

Senator MURKOWSKI. Thank you very much for that very interesting testimony, Dr. Smith.

[The prepared statement of Dr. Smith follows:]

# TESTIMONY OF CLAYTON S. SMITH, PH.D
# ON
# POTENTIAL USES OF SALINE WATERS DERIVED FROM THE COLORADO RIVER QUALITY IMPROVEMENT PROGRAM

June 22, 1982

My name is Clayton S. Smith, I am Division Manager of the Solar Fuels and Chemicals Research Division of the Solar Energy Research Institute in Golden, Colorado. I am trained as a chemical engineer and received my Ph.D in 1963 from Purdue University. Prior to joining SERI in 1978, my career included fifteen years of diverse industrial research, development and engineering experience. This work included significant projects involving mineral recovery from geothermal brines and seawater. It is my distinct honor and pleasure to suggest several potential beneficial uses of saline waste waters derived from the Colorado River Water Quality Improvement Program.

The Bureau of Reclamation of the Department of the Interior has well documented the magnitude of the salinity problem and has identified many of the natural and human-related sources of dissolved salts. For example, the saline springs of the Glenwood-Dotsero area of Colorado adds about 440,000 tons of salts per year and the Palo Verde Irrigation District of California returns over 500,000 tons of salts per year. The salinity of the water, as measured at the Imperial Dam, now exceeds the threshold above which conventional agricultural losses are encountered. One possible use for the saline concentrates which would be available from the improvement program might be for the production of microalgae. In addition, such an enterprise would use land currently rendered unsuitable for conventional agriculture due to the lack of sufficient irrigation water.

Microalgae are microscopic organisms most easily described as the simplest form of plants. Through photosynthesis they are able to utilize solar energy to convert water and carbon dioxide into plant material. Most will also utilize the bicarbonate ions usually found in saline waters. Microalgae have no roots as do higher plants and consequently usually grow in water. They are found in surprising places, such as a dewdrop in the desert, in snow banks, and even in thermal hot springs. Due to this diversity they are extremely interesting chemically; due, in part, to their relative simplicity, they are generally more efficient producers of organic material than higher plants. Champions in terrestrial plants do well to produce 10-20 dry tons of plant material per-acre per-year; microalgae can produce 60-80 dry tons per-acre per-year.

Some of the more interesting species thrive in highly saline waters. Saline water concentrates such as would be obtained from the Glenwood-Dotsero hot springs or the Palo Verde irrigation run-off are well suited for the production of microalgae.

There is growing worldwide interest in the cultivation of microalgae for profit. For example, an Israeli company is beginning to produce glycerol (an industrial chemical), a protein feed, and a vitamin supplement from one such microalgae; a mining company in South Africa is developing microalgae to recover values and treat mine waste waters; and a venture in Mexico is raising a species as a health food. These are meager beginnings, for the true potential of microalgae is enormous and research to develop this potential has hardly begun.

The Solar Energy Research Institute (SERI) is conducting such a research program for DOE. SERI is collecting, screening and characterizing interesting species. Research on microalgae has shown the following:

1. Yields of well over 60-tons per-acre per-year have been demonstrated in small outdoor systems.

2. Up to about 90% of the total product can be oil.

3. A variety of products may be produced, depending on species and cultivation methods. Using relatively conservative valuation, one species can produce over $20,000 of revenues per-acre per-year in vegetable oil, protein meal and a vitamin A precursor.

4. Some species will grow in very concentrated salt solutions.

5. Nearly all species will concentrate nutrients normally found in natural saline waters, such as potash and bicarbonate.

The cultivation of large quantities of microalgae for oil will require large quantities of carbon dioxide. Some is available as bicarbonate from waste waters, some could be obtained from carbonate rocks, some from sewage treatment facilities, the remainder could be obtained from the atmosphere as in normal agriculture. However, there are projections that over 15,000 megawatts of coal-fueled electric power might be added to the Colorado River basin within the next few decades. Stack gases from such plants contain approximately 8-12% $CO_2$ and would make an excellent source of this nutrient for microalgae. Due to the significant potential for sound economics, the great flexibility provided by microalgae, the present and increasing problems of Colorado River salinity, and the availability of low-cost land in many areas of the Southwest, microalgae offer a most interesting opportunity.

Another opportunity which has been suggested in concept studies by the Bureau of Reclamation is the use of Salt Gradient Solar Ponds. Such ponds use concentrated salt brines to collect solar energy efficiently. This relatively low cost source of heat is then used to drive an organic Rankine cycle (ORC) generator to produce electric power or shaft work. The feasibility of this concept and the necessary hardware has been demonstrated in Israel at Ein Bokek by Ormat. SERI has prepared a conceptual design of a similar system for the Army Corps of Engineers as part of a chloride control project in the Red River Valley of Texas. Power output of over 10 Kilowatts per-acre is easily obtained. Costs depend largely on the cost of building the solar ponds and the cost of salt for filling the ponds. Considering the availability of high insolation, low cost land with adobe soils, and huge quantities of waste brines from the water quality improvement program, salt gradient solar ponds are potentially attractive.

Opportunities may exist which couple the salinity control works with microalgae culture, coal-fired power plants, and salt gradient solar ponds. I believe the chances are good that economically attractive projects can be developed.

Senator MURKOWSKI. Are you in communication with the Department of the Interior or the Department of Agriculture concerning the application of the principles that you have highlighted?

Dr. SMITH. Yes. We have given a briefing to Mr. Barnett earlier and to other people. The work is funded partly by the Department of Energy, and we have given a number of briefings there.

Senator MURKOWSKI. Have you been encouraged by those agencies?

Dr. SMITH. Oh, yes, absolutely.

Senator MURKOWSKI. Where do you go from here with this? Do you go to Pat O'Meara and ask Pat to carry the word a little bit around the National Water Resources Association members?

Dr. SMITH. From a research standpoint, the screening of microalgae is almost an untouched field. They are an unusual organism. They exist everywhere, and we need to identify good candidates for commercialization.

Senator MURKOWSKI. And this is one of them, in your opinion?

Dr. SMITH. Yes, absolutely.

Senator MURKOWSKI. Is there a government agency that is charged with the responsibility of working up with an agency such as the Solar Energy Research Institution to actively promote the feasible development of this concept?

Dr. SMITH. Well, the Solar Energy Institute is operated by the Department of Energy, and the Department of Energy has the lead Federal role in this area and they are very supportive of the work, encouraging of it.

We need to develop species. We need to demonstrate some of the requirements for cultivation, and we hope very much we will have private interests pick it up.

We would like very much to get this out in the private sector for development. There is an interest, the testimony I mentioned, some work in Israel.

There is a specialty operation in Israel. There are operations in Mexico, South Africa, France. So there is commercial interest around the world.

Senator MURKOWSKI. I had in mind agencies like the National Science Foundation, which provides funds for experimental purposes.

Are these agencies working with you?

Dr. SMITH. We have not approached the other agencies for funding, but we have from the standpoint of communications.

Senator MURKOWSKI. How far away in time do you feel this principle is?

Dr. SMITH. Well, I think within the next year or so there could be some demonstration. On a larger scale as far as the research, the number of species has hardly been scratched and there is a lot of opportunity to continue screening.

Senator MURKOWSKI. Is there money in the Department of Energy budget for next year to proceed with this?

Dr. SMITH. Yes, sir, there is.

Senator MURKOWSKI. Does OMB encourage these type of expenditures considering the tremendous savings to the Federal Government?

Dr. Smith. We don't deal directly with OMB, but they are quite aware of this, and my perception is they are cooperative.

Senator Murkowski. When I have the opportunity, I will make sure I ask. I will ask OMB that question and get them on the record and see if you have got a budget next year or not.

Well, I would certainly encourage the continued research and hopefully the economic application of this type of process because it is far-reaching and ultimately a high efficiency operation.

Our next witness is Dr. Brent Blackwelder, Washington representative, Environmental Policy Center. We welcome your testimony and ask that you proceed.

## STATEMENT OF DR. BRENT BLACKWELDER, WASHINGTON REPRESENTATIVE, ENVIRONMENTAL POLICY CENTER, WASHINGTON, D.C.

Dr. Blackwelder. Thank you. I will just summarize my statement, Mr. Chairman. I wish to make four points about the legislation pending before you.

The first concerns water conservation; the second, industrial uses of saline water; the third concerns overall objectives, and the fourth concerns cost-sharing. In the area of water conservation we think that there are opportunities for improving the legislation, such as by giving explicit recognition to such techniques as irrigation, scheduling appropriate retirement of margin of land and use of some innovative cropping with some plants, such as guayule, jojoba, and euphorbia.

These plants produce oil and rubber. We support appropriate financial incentives to speed adoption of these onfarm and off-farm water conservation measures.

We would support also financial incentives in the form of low interest long term loans or tax credits to help achieve water conservation.

Turning next to the question of industrial use of saline water, we are concerned that the legislation as now written appears to give a signoff for authorization on projects which could be extremely large.

Let's take the proposal just discussed, salinity pipeline. I attended a briefing by Grace Co. and appreciate their openness in discussing all the factors of this proposal with the national conservation organizations.

This proposal may merit our support, we may oppose it, we may take no position on it, depending on the final feasibility studies.

Senator Murkowski. You don't have any input with OMB?

Dr. Blackwelder. We ship them our views, of course, but the concern we have—at this point we don't know the feasibility.

We think on projects that cost more than $25 million that you should reserve the right to give your approval in the context of the overall objectives, and certainly on a proposal of this magnitude it may turn out to be superb, it may not.

So we recommend that the change be put in by legislation. We would also like to see language putting salinity control in the context of other objectives so that the bureau as it proceeds with salinity control is aware of other environmental problems in the basin and, thus, does not support otherwise environmentally unacceptable energy projects in the name of salinity control.

And, finally, we would like to see some repayment on some of the control measures, and we suggest that appropriate formula might be apportioned to the salinity.

As the chart shows you there, it is estimated that about 37 percent of the salinity increase is caused by irrigation. We recommend that would be an appropriate level of cost-sharing.

And the point we make simply there is that since the overall irrigation program is of benefit to the basin, that they should not be shielded from the side effects of cost of that and have the Federal Government assume all the costs.

And that concludes my statement.

Senator MURKOWSKI. Thank you, Dr. Blackwelder. We appreciate your concise statement recommendations. I have no questions.

[The prepared statement of Dr. Blackwelder follows:]

ENVIRONMENTAL POLICY CENTER
317 Pennsylvania Ave., S.E., Washington, D.C. 20003
202/547-5330

Testimony of
Dr. Brent Blackwelder
Before the Senate Committee on Energy & Natural Resources
Concerning S.2202 (Amendments to the Colorado Basin Salinity Control Act)
June 22,1982

The Environmental Policy Center has had a long-standing interest in the Colorado Basin, having testified on the Yuma Desalting Plant in the early 1970's and on numerous other salinity and water development issues in the Basin. We have reviewed the pending amendments to the Colorado Basin Salinity Control Act (S. 2202) and wish to offer a number of suggestions for improving the legislation. We believe that several changes should be made in order to make the legislation environmentally balanced and to insure that significant progress is achieved in reducing salinity.

## WATER CONSERVATION

S.2202 would establish an on-farm water conservation program under the jurisdiction of the Department of Agriculture. We commend the explicit recognition of the importance of on-farm water conservation measures.

Section 202 (c) directs the Secretary of Agriculture to carry out a "voluntary cooperative program with private landowners to improve on-farm water management" (emphasis added). We understand the natural resistance of farmers to any mandatory water efficiency improvement program. However, the situation in the Colorado Basin is serious and could become much worse. The approach we urge the Committee to authorize consists of directions to the Secretary of Interior to include in all water service and repayment contracts a requirement for the most cost-effective measures to improve efficiency in water use. The bill should then give explicit recognition to some of the very important techniques of irrigation scheduling, appropriate retirement of marginal land, use of innovative cropping with varieties of low-water use crops such as guayule, jojoba, and euphorbia. These plants produce oil and rubber. We support appropriate financial incentives to speed adoption of these on-farm and off-farm water conservation measures. The potential of efficiency improvements is tremendous.

During the California droughts of 1976-77, a Federal Interagency Task Force looked into the potential for increasing efficiency in agricultural water use. The Task Force estimated that for the 17 Western states 11 million acre feet in reduced diversions and 3.1 million acre-feet in reduced net depletions would be possible if the following measures were undertaken:

1) Off-farm: consolidation, realignment, and enlargement of conveyance facilities; ungraded lining and piping; improved control structures (total one-time cost of investment: $2.684)
2) On-farm: upgraded and piping; land leveling improved control structures (e.g. gate timers); change of irrigation method; irrigation management (e.g., scheduled application)((total one-time cost or investment: $3.412))

Cost-effective water conservation should be given full recognition by being required in all contracts from the Bureau of Reclamation.

## INDUSTRIAL USE OF SALINE WATER

S. 2202 provides in Section 202 (a) and (b) for industrial use of saline water. This is a laudable objective in general but specific safeguards are essential. The legislation should require explicit Congressional authorization for major projects involving industrial use of saline water.

For example, the Environmental Policy Center has examined the W.R. Grace Company proposal to ship coal in plastic bags to the West Coast via a saline slurry. When the final feasibility reports are completed, we may support the proposal, we may oppose it, or we may take no position. At the present time there are too many unknowns, such as the exact route of the pipeline and the method of disposal of the plastic bags. While we have no objection to a study of this proposed saline slurry, we do object to authorizing gigantic projects such as this in the absence of final feasibility and impact reports.

S.2202 should, therefore, require that explicit Congressional authorization be obtained for those joint ventures whose cost exceeds $25 million.

## SALINITY CONTROL VS. OTHER OBJECTIVES

It would be desirable for S. 2202 to consider salinity control in the context of other broad environmental objectives for the Basin. Single-minded pursuit of salinity control without recognition of problems such as deteriorating air quality would be a mistake.

We hope that the intention of this legislation is not to be giving impetus in the name of salinity control to otherwise environmentally unacceptable energy projects such as the Harry Allen and Warner Valley power plants.

## REPAYMENT OF SALINITY CONTROL

Apart from water conservation incentives such as low-interest loans or tax credits, the costs of salinity control should be repaid by beneficiaries of Bureau municipal and agricultural water in the proportion to the salinity increase caused by Bureau projects. Thus if 37% of the salinity is attributable to irrigation, then 37% of the cost of the program should be repaid by irrigators. The beneficiaries should not be shielded from the costs and consequences of their projects.

Senator MURKOWSKI. Our wrap-up witness is Mr. Pat O'Meara, executive vice president of National Water Resources Association, Washington, D.C.

Mr. O'Meara, you may proceed.

## STATEMENT OF J. W. "PAT" O'MEARA, EXECUTIVE VICE PRESIDENT, NATIONAL WATER RESOURCES ASSOCIATION, WASHINGTON, D.C.

Mr. O'MEARA. Thank you, Mr. Chairman. I have a speech prepared for the record.

Senator MURKOWSKI. We will accept your speech.

Mr. O'MEARA. The statement supports enactment of S. 2202, so I would like to take a brief 30 minutes or so just to make some comments.

I would like to highly commend the chairman for the emphasis he has placed on the OMB role in this leglislation here this morning because the OMB role has been very substantial over the entire span of this activity.

I think it would go clear back to 1944 in the debate in the U.S. Senate that surrounded the enactment of the treaty, approval of the treaty with Mexico.

It was very clear in the debate from the U.S. Senators that the water quality was not a part of the requirement to deliver 1.5 million acre-feet of water to Mexico.

I think if you looked at that debate we could deliver them sulfuric acid and if it flowed across the border and met our conditions.

It met our conditions, but if you study the Mexican debate in their Senate, it was clear that water quality was very much a part of what they expected.

It was not clear what quality they expected, but certainly they expected good quality water, and those concepts began to clash along around 1961–62 when we put Welt Mohawk District on line.

That is the last irrigation district in the United States. That had a salinity of 3,400 parts of salt. And that last shot of salt into the river just above the border gave the Mexicans a much higher salinity than the last point of use in the United States, which was the diversion material.

So when the President came to the United States in 1973, as Mr. Friedkin indicated, it was the number one problem between the United States and Mexico as far as the Mexicans were concerned, and that was number one on his list for discussion with Nixon.

Nixon appointed Herbert Brownell as Ambassador to study this problem. We considered a desalting plant at Yuma to make the Mexicans receive water equal to our last diversion.

The President approved that program, but he never quite got OMB to buy it. They objected very strenuously. They filed a Minority Report. They said that their action would be to do nothing and let Mexico take us to the World Court. And they even figured out the World Court had fined us $9 million and that was the least cost solution to this problem.

Brownell said they wouldn't fine the $9 million if I was on the World Court, so they had another solution, and that was to dilute the water, send more than 1½ million acre-feet across the water, and it was fine for them to give away the water that belonged to the States.

And the States objected strongly to that solution. So eventually the desalting plant was approved. One of the major reasons to do this, but OMB, as I think the testimony of the Government witnesses today, have slowed this program down more than any authorization has slowed it down.

It has been the scheduling of money that has come in that has adversely affected the program. When we did finally propose the 100 million gallons per day desalting program, all of those activities would have only affected the salinity for the Mexican farmer.

There was nothing in the original bill that OMB approved that would put the ppm on our side of the border, and the Western States urged that title II be added to that bill, and it was added, and the Congress approved it, and that is where this program has come from.

The funny thing is it goes back historically that OMB wanted to do nothing about this problem. So it has moved, and Mr. Kennedy has said it has moved, and we can take some great pleasure that it is moving, but it should be moving much faster, and S. 2202 would help do that.

I would like to suggest, as was brought up by W. R. Grace, that maybe one of the most important aspects of this new bill is paragraph 9 which proposed it be added.

I would ask that paragraph 9 might be even strengthened more. It says to add the words "to conduct research and development activities to demonstrate saline water use technology."

The Office of Water Research and Technology by the Department of Interior is to be absorbed by the Department of Reclamation.

It can be used as a focus to support the studies like W. R. Grace is conducting and the Solar Institute is conducting and other opportunities that may present themselves to solve this problem in that regard.

The onfarm work that has been done has reduced the salinity of the return flows through the Colorado River sufficiently so that 100-million-gallon-per-day plant has been down at a cost savings in construction of over $100 million.

So it points out the very beneficial aspects of continued research as we proceed with this difficult problem. Thank you, Senator, for allowing me to make that.

I want to say I was glad to hear Mr. Broadbent say that the principles and guidelines should not apply towards this program because certainly the principles and guidelines are designed for projects for water yield, and if you are trying to apply them to water quality, they just won't work.

All they will do is stop the program. So I am glad the administration has come in that direction.

[The prepared statement of Mr. O'Meara follows:]

STATEMENT OF

J. W. "Pat" O'Meara
Executive Vice President
National Water Resources Association

before the
Subcommittee on Water and Power

of the
Committee on Energy and Natural Resources
United States Senate
Washington, D.C.

June 22, 1982

Mr. Chairman and Members of the Subcommittee:

It is my pleasure to appear before the Subcommittee today on behalf of the National Water Resources Association. NWRA is a confederation of the State water user associations of the 17 Reclamation States and Hawaii. This year, 1982, we celebrate our Golden Jubilee. Over that 50 year period, NWRA has established a long record of vigorously advocating the development and wise use of water resources, including our support of many worthwhile Federal Reclamation projects.

It is the basic objective of NWRA to promote the development, control, conservation, preservation, and utilization of the water resources of the Nation. Our efforts to achieve that goal are marked by remarkable monuments of concrete and steel that have changed the Colorado River from a wild and worthless mustang to a servant of the people and a lifeline of prosperity. Where once it uselessly thundered and gouged its way to the Gulf of California, it now produces enormous amounts of electric energy and provides water for domestic, industrial, and agricultural pruposes.

The benefits that have accrued and will continue to accrue from the development of the Colorado are enormous. It is not a super river; it pales in size when compared with the Mississippi or the Columbia, but it flows through the most arid region of our Nation, and only through the conservation and wise use of this singular resource could the continued prosperity of the entire region it drains be assured.

While the programs to harness this once treacherous river have resulted in fantastic benefits to the entire Southwest, and, indeed the Nation, they have resulted in some problems, the major one of which is the subject of this hearing and of S. 2202--salinity.

The salinity of the Colorado is not something new. It was a problem when the first Spanish Conquistadors explored the region. Much of the land area drained by the Colorado is laden with natural salts. Rainfall dissolves some of these salts and, as the water flows across the land and eventually into the Colorado, it brings tons of salt with it. Additionally, there are major salt springs along the course of the river that daily add to the salt burden of the river. All of this contributes to the natural salinity of the river--none of it from human activity.

The successful efforts to control and utilize the Colorado have, however, resulted in an increase of the salinity of the river; perhaps even doubling the total dissolved solids from about 450 dissolved parts of salt per million parts of water (ppm) up to nearly 900 ppm.

Salinity is a very complicated subject; one that often is over-simplified. For purposes of comparison, I would like to point out that sea water contains about 35,000 ppm. The U. S. Public Health

Service says that good drinking water should not contain more than 500 ppm, and water containing more than 1000 ppm should not be used for human consumption. Corps, on the other hand, can be highly sensitive to certain salts. For example, 1 ppm of boron can destroy an avacado crop, while onions, in some soils, can be successfully irrigated with water of well over 5000 ppm.

The increase in salinity from the development and use of the waters of the Colorado can be attributed mostly to return flows from irrigation projects. As the water diverted from the river is used to irrigate crops grown on saline soils, it picks up some salts and carries them back to the river. About 80 percent of the man-made increase in river salinity can be traced to this activity. Water stored in the large main-stem reservoirs is subject to evaporation with the result that the water that did not evaporate has an increased percentage of salinity. About 20 percent of the salinity increase can be attributed to evaporation.

A decade ago, return flows from the Wellton-Mohawk Project, the last irrigation project on the Colorado River before the river flows across the international border into Mexico, had a salinity of over 3000 ppm. This last increment of salt flowing to the river caused a problem with our good neighbor to the South. To alleviate this problem, President Nixon recommended, and the Congress approved, the construction of a 100 million gallon per day desalting plant based on technology developed by the Office of Saline Water of the Department of the Interior.

This plant is currently under construction near Yuma, Arizona, to alleviate the salinity problems of the farmers in the Mexicali Valley at a cost to the U. S. Government of about $500 million.

Now, the people of the Southwest United States who depend on the Colorado River for their water need to alleviate the problems they encounter because of the salinity of the Colorado River, and that is the purpose of S. 2202.

We urge the Subcommittee to approve this very important bill.

Since the enactment of the original Colorado River Salinity Control legislation in 1974 (P.L. 93-320), considerable progress in the effort to curb the salt flow in the Colorado River can be noted through the projects that have been constructed. During the past 8 years, a considerable amount of valuable new data on the salinity of the river has been developed and new ideas and approaches on salinity control have evolved. This legislation will permit the scientists and the engineers of the Department of Agriculture and the Department of the Interior to implement important new activities.

In addition to authorizing several projects that will provide substantial beneficial results, even more importantly, the proposed legislation adds paragraph (9) to section 202(a):"Saline water use and disposal opportunities unit, consisting of measures and all necessary, appurtenant, and associated works to demonstrate saline water use technology and to beneficially use and dispose of saline and brackish waters of the Colorado River Basin in joint ventures with current and future industrial water users, using the concepts generally described in the Secretary's special report of September 1981 entitled 'Saline Water Use and Disposal Opportunities'."

The research efforts authorized by this paragraph may well provide the ultimate solution to this vexing problem.

It is indeed a problem, and, although it is complex, it is a problem that can be solved, and S. 2202 provides the key to that solution.

Earlier in my statement I mentioned a 100 million gpd desalting plant at Yuma. I would like to remind the Subcommittee that P.L. 93-320 was, in part, a result of an agreement between President Nixon and President Louis Echeverria of Mexico. President Echeverria, during a visit to Washington, described the salinity of the Colorado River flowing into Mexico as the number one problem between our two countries. To resolve that problem, President Nixon proposed several projects to reduce the salinity of the river flowing into Mexico to a point where the water would be approximately the same salinity as the quality of water at the Imperial Dam, which is the last diversion point in the U. S. Central to that proposal was a 100 million gallons per day desalting plant using technology developed by the Department of the Interior. The Congress approved the President's proposal, but that proposal provided relief from Colorado River Salinity to only the farmers of the Mexicali Valley.

As a result of testimony by many officials and citizens of the 7 Colorado River Basin States, the Congress added Title II to the Administration proposal, much, I might add, to the dismay of OMB. OMB was ready to approve funding to improve the quality of water for the Mexican farmer, but objected to Federal expenditures to enhance the quality of the river in the U. S.

Knowing how OMB operates, I would expect it would oppose S. 2202, or perhaps insist that all projects be advanced under the recently announced "Economic and Environmental Principles and Guidelines." The new guidelines are feasible if they are applied to projects providing water yield, but they are not designed nor do they apply to water quality. The only spending criteria that is necessary is to utilize the most cost effective solution and to proceed with the resolution of the costly salinity problem.

I would like to point out to the members of the Subcommittee that the success that already has been achieved through salinity control programs authorized by Title II has resulted in a decreased salt load in the Wellton-Mohawk return flows. This reduction will permit the Yuma desalting plant to be down-sized from 100 million gpd to about 73 million gpd. This single development will result in a savings in desalting plant investment and operating costs of over $100 million. This is but one example of the beneficial aspects we can anticipate through the programs authorized by S. 2202.

Senator Murkowski. Thank you, Mr. O'Meara. I think you have kind of summarized the highlights of the hearing. I certainly concur with the recommendation and the testimony by the Solar Energy Group and W. R. Grace as well as others have a real application.

I note your emphasis on the fact that I believe the Bureau of Reclamation is taking over the saline water, and I think it appropriate to note we have had, I believe, a representative of OMB at the hearings, so perhaps the message will be returned to those that are responsible for some of the policies of OMB.

Mr. O'Meara. I am not sure because working with OMB is like swinging against the clouds. I never find them to be very firm.

Senator Murkowski. I think it is a matter we would all agree there is a division of responsibility: At what point one role basically leaves it and another's responsibility picks up.

The professional aspects of that logic dictate that the Department heads are free to give their best professional recommendation on appropriate questions that are before us at this hearing.

With that, I would thank again all those that testified this morning. I think we have gone a long way in establishing the merits and recommendations and suggested amendments to the bill.

I think the testimony has been sound and certainly in the best interest of the concern over the salinity in the Colorado River and the obligations we have to the country of Mexico, commitments that have been previously made.

I also want to thank those who have sat through the hearing for whatever particular purpose. With that, I would again remind you that the record will be open for a period of 10 days, and thank you for your testimony at the hearing.

[Whereupon, at 11:50 a.m., the hearing was adjourned.]

# APPENDIX

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## ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD

OFFICE OF THE GOVERNOR
STATE HOUSE
PHOENIX, ARIZONA 85007

BRUCE BABBITT
GOVERNOR

IN REPLY
REFER TO:

June 24, 1982

The Honorable Frank H. Murkowski
Chairman, Subcommittee on Water and Power
Committee on Energy and Natural Resources
United States Senate
Washington, D. C. 20510

Dear Senator Murkowski:

I appreciated your invitation to testify at the June 22nd hearing before the Water and Power Subcommittee of the Senate Committee on Energy and Natural Resources on S. 2202, a bill to amend Title II of the Colorado River Basin Salinity Control Act.

I strongly support the provisions of S. 2202 and urge its prompt passage. I also request that this letter be included as part of the records of the hearings before your subcommittee.

Arizona, along with the other Colorado River Basin states, has a vital interest in all aspects of the Colorado River, including the problem of increasing salinity in this very important river. Representatives of the state were instrumental in securing passage of the Colorado River Basin Salinity Control Act in 1974 (P.L. 93-320) and have worked in harmony with leaders of the other basin states and the federal agencies in the overall efforts to control salinity of the Colorado River.

The seven basin states, through their membership in the Colorado River Basin Salinity Control Forum, have developed water quality standards for salinity including numeric criteria and plan of implementation for salinity control for the Colorado River system. These standards have been adopted by the states and approved by the Environmental Protection Agency. They call for the maintenance of salinity levels in the lower mainstem of the Colorado River at 1972 concentration levels while the states continue to develop their compact apportioned water supplies. The 1972 annual weighted total dissolved solids concentrations range between 723 mg/l below Hoover Dam to 879 mg/l at Imperial Dam.

Approximately 10 million tons of salt reach Lake Mead each year from natural and man-induced causes. It has been determined that by the turn of the century 2.8 million tons of salt must be removed or prevented from entering the river annually in order to meet the salinity standards as identified by the numeric criteria. Without salinity control measures, it is estimated that the concentrations at Imperial Dam will exceed 1,100 mg/l soon after the year 2000.

Economic damages caused by existing levels of salinity to agricultural, municipal and industrial water users is a matter of great concern. These damages are currently estimated at approximately $100 million annually for Lower Basin water users. It is further estimated by the Bureau of Reclamation that each additional increase of one mg/l at Imperial Dam over existing salinity levels causes an increase in damages of one-half million dollars.

The Colorado River is already a major source of water supply for the State of Arizona and following completion of the Central Arizona Project will provide 60 percent of our state's dependable supply. Consequently, the control of salinity levels in the river is very important to the state.

S. 2202 would authorize additional salinity control measures and make other changes necessary to accomplish the objectives of Title II of the Colorado River Basin Salinity Control Act. Again, I strongly support this important legislation.

Thank you for the opportunity to submit this statement.

Sincerely,

Bruce Babbitt
Governor

BB:dpb

**STATE OF UTAH**
OFFICE OF THE GOVERNOR
SALT LAKE CITY
84114

SCOTT M. MATHESON
GOVERNOR

June 17, 1982

The Honorable Frank H. Murkowski
Chairman
Subcommittee on Water and Power
2104 Dirksen Office Building
Washington, D.C. 20510

Dear Senator Murkowski:

I appreciate your inviting me to testify at the June 22 hearings concerning S. 2202 which is on Colorado River Basin salinity control and which is a very timely and important issue for the residents in the State of Utah. Unfortunately, the press of State business will not allow me to travel to Washington at the time of the hearings to personally support the legislation. I hope that you will accept my apologies and note my total support for the legislation.

The Colorado River will be totally utilized within a decade or two. The utilization of the River in an effective and harmonious way can only occur if the seven Colorado River Basin states and the Federal Government work closely together to see that all interests and rights are protected. The complex weaving of state and Federal laws with litigation, compacts, agreements, and accords, has compiled a body of documents commonly referred to as the "Law of the River." The water quality concerns that have been brought to the forefront in the last decade,pose an additional challenge with respect to the Colorado River because of the already established water quantity laws, the anticipated total use of the River, and the unique water quality problem of salinity.

In 1974, the states and the Federal Government agreed upon an approach to salinity control in the Colorado River Basin. This agreement was carefully constructed to protect all interested parties and represented a unique, if not remarkable, approach as sovereigns worked in comity to solve a common problem. The basin-wide solution, as described in Title II of P.L. 93-320 (Colorado River Basin Salinity

Control Act), was tested in the courts by environmental groups and was found to be in keeping with federal and state laws.

Much research has been done since the passage of the Act in 1974. That Act was intended to provide interim legislation until more facts were gathered. We are now in a position to modify the Act so that our efforts can be more efficient, our monies spent in a more cost-effective way,and the water quality goals of the river reached.

The seven Colorado River Basin states, working within the framework of the Colorado River Basin Salinity Control Forum, have spent the last year drafting legislation which all of the states support. The concepts agreed to by the states are embodied in S. 2202. I can assure you that I and the other Basin governors fully support this legislation. The testimony that will be given by the Colorado River Basin Salinity Control Forum is the testimony of the State of Utah and the other Basin states.

I will be most appreciative if you and your colleagues will give your full attention to this matter and move it through the Congress in this session.

Thank you for your interest and your efforts in our behalf.

Sincerely,

Governor

SMM:tar

**American Farm Bureau Federation**

AMERICAN FARM BUREAU FEDERATION

WASHINGTON OFFICE
600 MARYLAND AVE., S.W
SUITE 800
WASHINGTON, D.C. 20024
AREA CODE 202 - 484-2222

June 23, 1982

Honorable Frank H. Murkowski, Chairman
Subcommittee on Water and Power
Senate Committee on Energy and Natural Resources
A-420 Immigration Building
Washington, DC 20510

Dear Senator Murkowski:

Farm Bureau wishes to express its support for S. 2202, to amend the Colorado River Basin Salinity Control Act of 1974.

This legislation would authorize six new salinity control units, to be constructed within the funding ceiling of the 1974 Act. One of these units would, for the first time, involve federal lands under the control of BLM, and another would demonstrate technologies for beneficial disposition and use of saline waste waters.

A large network of canal and lateral systems would be improved under this bill. Everything but the salinity benefits would be reimbursed to the federal government by the water users who benefit.

The measure also would authorize a more effective on-farm salinity control program through the USDA. The program would be undertaken on a cooperative basis with private landowners. Attempts to use existing USDA programs are not resulting in the progress that could be expected from a tailor-made activity.

The salinity level of the Colorado River is increasing at an unacceptable rate. About one-half of the salinity comes from natural sources. The other half is attributable to man's activities.

The higher salinity levels cause decreased crop yields for farmers, and require them to alter crop patterns, increase leaching and draining practices, and increase management costs. According to the Bureau of Reclamation, an increase of just one milligram of salt per liter of water results in a $141,600 loss by agriculture.

S. 2202 would further the much needed effort of cleaning up the Colorado River which was begun under the Colorado River Basin Salinity Control Act of 1974.

We request that our views be included in the hearing record on this legislation.

Sincerely,

John Datt

John C. Datt
Secretary and Director
Washington Office

lh
cc: Subcommittee Members
Senator Armstrong

1876

**COLORADO STATE SOIL CONSERVATION BOARD**
618A State Centennial Building
1313 Sherman Street
Denver, Colorado 80203
Phone 866-3351

Richard D. Lamm
Governor

Allen J. Campbell
Director

June 16, 1982

Mr. Russ Brown
Dirksen Senate Office Bldg.
Room 3104
Washington, D.C. 20510

Dear Mr. Brown,

The Colorado State Soil Conservation Board is certainly in favor of the amendments to the Colorado River Basin Salinity Control Act as provided for in Senate Bill 2202.

The increased benefits to the landowners in Colorado and other states in the form of water quality will be considerable. The more efficient irrigation water management will provide a savings in labor and energy as well as the water itself. The communities near any of the projects will also benefit due to a more stable agricultural economy.

We appreciate Senator Armstrong's efforts and wish him success on these proposed changes.

Sincerely,

Sherman Blach

Sherman Blach
President

SB/ks

ENVIRONMENTAL DEFENSE FUND

# COMMENTS

on

S-2202

Proposed Amendments to
Colorado River Basin
Salinity Control Act

before

the Senate Committee on
Energy and Natural Resources

by

Environmental Defense Fund

Boulder, Colorado

June 22, 1982

Daniel F. Luecke, PhD

Senior Scientist

1405 Arapahoe Avenue Boulder, Colorado 80302 ☎ 303-440-4901
OFFICES IN: NEW YORK, NY (NATIONAL HEADQUARTERS), WASHINGTON, DC; BERKELEY, CA; DENVER, CO

# COMMENTS ON S-2202

## Proposed Amendments to Colorado River Basin Salinity Control Act

### Introduction

The Colorado River drains a watershed that is approximately one-twelfth of the continental United States (246,000 square miles) plus an additional 2000 square miles in Mexico. The river extends 1400 miles from the Continental Divide in the Rocky Mountains to the Gulf of California.[1]

In the United States the Colorado River Basin covers parts of the states of Wyoming, Colorado, Utah, New Mexico, Nevada, Arizona, and California. It has a population of more than 2.4 million and through export projects, its water provides either full or supplemental supplies to almost 15 million people in the Southern California, Denver, Salt Lake City, Cheyenne, and Albuquerque areas. With the completion of the Central Arizona Project, now under construction, the Phoenix and Tucson areas will also be served from the lower main stem. Approximately 2.5 million acres are irrigated within the basin in the U.S., two-thirds of which are in the Upper Basin and one-third is in the Lower Basin. In addition, 425,000 irrigated acres in Mexico are served with Colorado River water.

It has long been recognized that water quality problems are related with, and equal in importance to, water quantity problems in the planning and development of water resources. In the Colorado River Basin the link is particularly important. The river is close to full utilization and the chemical quality of the water is becoming a major concern.[2]

Salinity, or total dissolved solids (TDS), is the most serious water quality problem in the Colorado River. The problem came to the forefront in the early 1960's when the salinity of water delivered to Mexico almost doubled. In 1961, return flows from the Welton-Mohawk Irrigation District with an average of about 6,000 mg/l of TDS began discharging into the Colorado River above the Mexican border. Two years later, when storage in Lake Powell began, salinity of the water available to Mexico increased from an annual average of about 800 mg/l to nearly 1,500 mg/l.[3] But concern over salinity in the last two decades was not limited to Mexico. It was shared by all water users in the Lower Basin.

Studies by various agencies and individuals agree that salinity has increased, and will increase with continued use and development of available water supplies unless comprehensive, basin-wide water quality management planning is implemented.[4] Salinity has increased at Imperial Dam from 619 mg/l (1926-1935) to 879 mg/l in 1972.

Generally, salinity of the river increases from its headwaters to its mouth. The average annual concentrations range from less than 50 mg/l in the headwaters to about 865 mg/l at Imperial Dam. The increase is the result of two basic processes, salt loading (or adding salts) and salt concentrating (or reducing water supply). Salt loading results from both natural conditions and man's activities. Salt concentrating results when water is lost through evaporation and transpiration within the Basin or when water of higher quality than that of downstream points is diverted from the Basin. Estimates of salt contribution from the different sources appear in Table 1.

Table 1. Sources of Salinity by Percentage

| Sources of Salinity | Percentage Effect |
|---|---|
| Natural | 47% |
| Irrigation | 37% |
| Evaporation | 12% |
| Out-of-Basin Export | 3% |
| Municipal/Industrial Waste | 1% |

Source: See El-Ashry (footnote [1])

Of the man-induced salinity, currently over 75% is contributed by irrigated agriculture. Though the effects of evaporation and exports can be expected to increase, irrigation will remain the single most important man-made source. Irrigation increases salt load through return flows (including deep percolation), while salt concentrating effects result from the consumptive use of water through evaporation, transpiration, and seepage losses which do not return to the stream system. Moreover, irrigation in the basin depletes a significant quantity of flow from the Colorado River System. At present, over 90% of the total Basin withdrawals from ground water and surface water sources are for irrigated agriculture.

Records indicate that excessive amounts of water are applied to irrigated lands in some parts of the Colorado River Basin.[5] Irrigation efficiency averages less than 50%. The Environmental Protection Agency (EPA) identifies three basic reasons for over irrigation: (1) the incentive to use all the water historically diverted in order to maintain water rights; (2) an over estimate of the amount of irrigation water required to meet evapotranspiration and salt balance requirements; and (3) the inadequacy of most irrigation systems to operate in accordance with irrigation demands.[6]

Long-term average salinity levels have progressively increased in the Colorado River System as the Basin's water resources have been developed and consumptive use of water for various purposes has increased. This trend is expected to continue with future water resource development and escalate at a much higher rate should energy development proceed on a large scale in the Upper Basin.

## Colorado River Basin Salinity Control Act and Salinity Standards

In 1974 the U.S. Congress passed Public Law 93-320, "Colorado River Basin Salinity Control Act." Title II of the Act pertains to the Upper Basin and provides for the construction of systems to control the salinity contributions from four particular sources and for the development of control plans for 12 other sources. The four initial units are: Paradox Valley, Grand Valley, Crystal Geyser, and Las Vegas Wash. Paradox Valley is a natural source of salinity, Grand Valley is an agricultural source, Crystal Geyser is an abandoned oil well, and Las Vegas Wash serves as a surface drain for all domestic, municipal, and industrial wastewaters from the Las Vegas Valley. The cost of the construction, operation, and maintenance of the four units had been estimated at $125 million based on April 1973 cost indexes and is now estimated at over $800 million. The Federal Government will pay 75% of this cost on a nonreimbursable basis. The Bureau of Reclamation, in coordination with other agencies is charged with the implementation of the salinity control plans.

Two years after the Act was passed, the EPA approved salinity standards and a plan of implementation (The Salinity Control Program) for the seven basin states. The approved standards set numeric criteria for salinity at three points on the lower main stem of the 1400 mile river (Hoover, Parker, and Imperial Dams). No salinity standards were actually set for the river or its tributaries in the states of Colorado, Wyoming, Utah, or New Mexico. Measuring salinity at only three points in the Lower Basin may seem like an unusual approach to water quality control, but it is by no means the only flaw in the plan. More important is the plan's dependence on three crucial conditions for its success. In order to meet the standards at the three control points the following assumptions must be met: (1) a virgin runoff of 15 million acre feet/year at Lee Ferry; (2) a low-to-moderate depletion level for consumptive withdrawals in the Upper Basin and a low level in the Lower Basin; and (3) the authorization, construction and successful operation of all proposed salinity control projects (under Title II of PL 93-320). Tables 2 and 3 demonstrate the relationship between the assumptions and the potential for failure of the program. As the tables make clear, should any one of the three assumptions prove to be wrong the salinity standards will be violated at one or more of the control points in both 1990 and 1995. (The situation is only likely to get worse in succeeding years).

With these prospects for the future, clearly it is time to reassess PL 93-320 and its relationship to the Salinity Control Program. As a first step it is time to consider what amendments to Title II might increase the likelihood that salinity can be brought under control in the Colorado River Basin. The proposal under consideration by this committee is such a step. It amends Title II of the Salinity Control Act authorizing additional projects,

Table 2. - Projected 1990 salinity levels
(mg/L)*

Numeric criteria: Hoover Dam 723, Parker Dam 747, Imperial Dam 879

| Average virgin flow (maf) | Location | Without salinity control projects | | | With three authorized salinity control projects | | | With all 14 salinity control projects | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Low depletion | Moderate depletion | High depletion | Low depletion | Moderate depletion | High depletion | Low depletion | Moderate depletion | High depletion |
| 13.0 | Hoover Dam | 770 | 776 | 793 | 746** | 752** | 768** | 740 ** | 745** | 764 ** |
| | Parker Dam | 781 | 789 | 809 | 756** | 763** | 782** | 749 ** | 757** | 775 ** |
| | Imperial Dam | 953 | 968 | 994 | 923** | 937** | 962** | 915 ** | 929** | 953 ** |
| 14.0 | Hoover Dam | 742 | 750 | 766 | 720 | 728** | 743** | 714 | 722 | 737 ** |
| | Parker Dam | 752 | 762 | 781 | 728 | 738 | 756** | 722 | 732 | 750 ** |
| | Imperial Dam | 918 | 935 | 960 | 890** | 906** | 931** | 882 ** | 899** | 923 ** |
| 15.0 | Hoover Dam | 712 | 720 | 738 | 690 | 698 | 716 | 684 | 692 | 710 |
| | Parker Dam | 720 | 730 | 750 | 697 | 707 | 727 | 691 | 701 | 721 |
| | Imperial Dam | 858 | 878 | 922 | 831 | 851 | 894** | 825 | 844 | 887 ** |

* The Colorado River System is subject to highly variable annual flows which affect the river's salinity. Although reservoir storage tends to dampen the effects of variable flow, it is probable that actual salinity levels will exceed or fall below the values shown on this table even though the conditions upon which the projections are based, such as average virgin flow and future level of development, are met.

** Violations of the standard

Source: Colorado River Basin Salinity Control Forum, Report on the 1981 Review - Water Quality Standards for Salinity Colorado River System (Proposed), July 9, 1981

Table 3. - Projected 1995 salinity levels
(mg/L)*

Numeric criteria: Hoover Dam 723, Parker Dam 747, Imperial Dam 879

| Average virgin flow (maf) | Location | Without salinity control projects | | | With three authorized salinity control projects | | | With all 14 salinity control projects | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Low depletion | Moderate depletion | High depletion | Low depletion | Moderate depletion | High depletion | Low depletion | Moderate depletion | High depletion |
| 13.0 | Hoover Dam | 801 | 816 | 853 | 757 ** | 771 ** | 804 ** | 730 ** | 744** | 774** |
| | Parker Dam | 813 | 831 | 872 | 767 ** | 784 ** | 821 ** | 739 | 755** | 788** |
| | Imperial Dam | 992 | 1,018 | 1,070 | 937 ** | 962 ** | 1,008 ** | 904 ** | 927** | 969** |
| 14.0 | Hoover Dam | 772 | 787 | 818 | 733 ** | 747 ** | 776 ** | 710 | 723 | 751** |
| | Parker Dam | 783 | 800 | 835 | 742 | 758 ** | 791 ** | 718 | 734 | 764** |
| | Imperial Dam | 957 | 981 | 1,026 | 907 ** | 931 ** | 972 ** | 878 | 901** | 940** |
| 15.0 | Hoover Dam | 739 | 755 | 788 | 702 | 718 | 730 ** | 680 | 696 | 727** |
| | Parker Dam | 748 | 767 | 804 | 710 | 728 | 763 ** | 687 | 705 | 740 |
| | Imperial Dam | 898 | 932 | 988 | 833 | 885 ** | 939 ** | 826 | 859 | 911** |

* The Colorado River System is subject to highly variable annual flows which affect the river's salinity. Although reservoir storage tends to dampen the effects of variable flow, it is probable that actual salinity levels will exceed or fall below the values shown on this table even though the conditions upon which the projections are based, such as average virgin flow and future level of development, are met.

** Violations of the Standard

Source: Colorado River Basin Salinity Control Forum, Report on the 1981 Review - Water Quality Standards for Salinity Colorado River System (Proposed), July 9, 1981 facilitating the industrial use of saline water, and giving somewhat more emphasis to changes in irrigation practice which might reduce the agricultural impact on river salinity.

EDF's comments are directed to two subsections in the proposed amendments: (1) the provisions for industrial use of saline waters (proposed Sections 202(a)(9) and 202(b)(1)); and (2) the amplification of the role of the Secretary of Agriculture and the responsibility for improving irrigation water distribution systems (Proposed Section 202(c)).

### Industrial Use of Saline Water

The Bureau of Reclamation has come to recognize that the Salinity Control Program for which it is responsible can not meet even the rather modest salinity standards proposed by the basin states and approved by the EPA. It needs to look beyond its public works agenda for solutions and one obvious place is the growing energy industry in the Upper and Lower Basins. Such initiative and imagination deserves support; in principle the use of saline waters for industry offers a number of advantages to all interests. Nonetheless, there are some important cautions to offer.

In its special report on saline water the Bureau lists several power plants which might be customers for brackish water (see, for example, *Saline Water Use*, Table 6, P. IV-9).[7] The need for any or all of these facilities remains an open question. In fact, EDF has been actively involved in opposing at least two of the units on the basis of need (Harry Allen and Warner Valley power plants).[8] Given the Bureau's search for saline water customers it is quite conceivable that it, and for that matter the entire Department of Interior, might line up on the side of an energy company whose project is neither necessary nor environmentally benign but which might serve as a ready customer for saline water. The proposed amendments make no provisions to safeguard against such an eventuality. Rather they suggest just the opposite with language like "[s]uch contracts or agreements shall define the responsibilities...to the end that the maximum reduction of salinity of the Colorado River will be achieved." Such singlemindedness is to be avoided. EDF has long been concerned with salinity in the river, but we have other environmental objectives as well. An untempered commitment to salinity reduction on the part of the Bureau's Salinity Control Program is unlikely to achieve an environmental balance we could support.

## Mitigation Practices and On-farm Programs

Given the monumental contribution of agriculture to the Colorado River's salt load and concentration it makes a great deal of sense to give more emphasis to irrigation practice and farm management. Unfortunately the proposed amendments take only a timid step. Though the amendments direct the Secretary of Agriculture to identify sources, develop plans, provide assistance, and carry out research, the Secretary is left with little direct authority to take action which will guarantee reductions in the full load. Moreover the only examples cited in the proposed amendments refer to capital intensive projects like the improvement of laterals. No mention is made of irrigation scheduling though there is reputable research which establishes its cost-effectiveness.[9] Nor is anything said of land retirement, another very effective and inexpensive means of reducing salt load.[11]

One wonders if such omissions are innocent oversights or deliberate attempts to add a new sheen to a troubled program, while avoiding any real commitment to effective, if controversial, actions.

Concluding Comment

On balance, the saline water use and irrigation practice provisions of the proposed amendments constitute a step in the right direction. In and of themselves, however, they do not represent a new direction -- a turn away from the traditional structural solution to an environmental problem. Much more must be done if salinity is to be controlled in an efficient and environmentally responsible fashion.

## Footnotes

A portion of the introductory comments is taken from El-Ashry, M.T., "Colorado River Salinity and Its Control," presented at the American Water Resources Association, November 1, 1977, Tucson, Arizona.

See, for example:

- Langbein, W.B., "Water Yield and Reservior Storage in the United States," *Geological Survey Circular 409*, Washington, D.C., 1959

Weinberg, E. " 'Salt Talks' United States and Mexico Style: A Care Study of the Lower Colorado Salinity Dispute," (Draft), May 23, 1973

- U.S. Environmental Protection Agency, *The Mineral Quality Problem in the Colorado River Basin*, 1971.

See, for example:

- U.S.E.P.A., *op. cit.*
- Mann, D.E., "Water Policy and Decision-Making in the Colorado River Basin," Lake Powell Research Project Bulletin No. 24, July, 1976
- Committee on Water of the National Research Council, *Water and Choice in the Colorado Basin*, National Academy of Sciences, Washington, D.C., 1968
- Utah State University, *Colorado River Regional Assessment Study*, prepared for National Commission on Water Quality, October 1975

See Law, J.P., Jr. and G.V. Skogerboe (editors), *Proceedings of National Conference on Irrigation Return Flow Quality Management*, Colorado State University, Fort Collins, Colorado, May, 1977

U.S. E.P.A., *op. cit.*

U.S. Department of Interior, Bureau of Reclamation, *Saline Water Use and Irrigational Opportunities (Special Report)*, Denver, Colorado, September, 1981

Environmental Defense Fund, *An Alternative To the Allen-Warner Valley Energy System: A Technical and Economic Analysis*, Berkcley, California, July, 1980

Jensen, M.E., "Scientific Irrigation Scheduling for Salinity Control of Irrigation Return Flow," in Law, J.P., Jr. *op. cit.*

See, for example, U.S. Department of Agriculture, Soil Conservation Service Report, *Big Sandy River: Colorado River Salinity Control Study*, November, 1980

THE MONTEZUMA VALLEY IRRIGATION CO.
P. O. Box 1056
CORTEZ, COLORADO 81321
PHONE 565-3332

June 30, 1982

The Honorable Frank H. Murkowski
Chairman
Subcommittee on Water and Power
Committee on Energy and Natural Resources
United States Senate
Washington, D.C. 20510

Dear Senator Murkowski:

This letter is written concerning S. 2202, a bill to amend the Colorado River Basin Salinity Control Act of 1974 (P.L. 93-320). We respectfully request that this letter be included in the printed record for the hearings held by your subcommittee on S. 2202 on June 22, 1982.

The Montezuma Valley Irrigation Company is the entity whose canals and laterals would be included in the proposed McElmo Creek Salinity Control Project, located in the vicinity of Cortez in southwestern Colorado. The McElmo Creek Project is one of the six new projects which would be authorized for construction by S. 2202. In addition, the lands under our irrigation system will probably be eligible to participate in the U.S. Department of Agriculture on-farm program which would be authorized by S. 2202.

The company favors the enactment of S. 2202 as introduced. Although certain details concerning the proposed McElmo Creek Project have yet to be worked out, we are willing to see the project authorized for construction at this time in order to avoid unnecessary delays in the implementation of the project. We also think it particularly important that the on-farm program be authorized since this will provide significant benefits both to local farmers and the overall objectives of the salinity control program.

We urge your subcommittee to act promptly and favorably in reporting S. 2202 to the full committee.

Sincerely Yours,

John Porter

cc: The Honorable William Armstrong
United States Senate

The Honorable Gary Hart
United States Senate

Mr. Jack Barnet
Colorado River Basin
Salinity Control Forum

Mr. Russell Brown
Professional Staff
Subcommittee on Water and Power
Committee on Energy and Natural Resources

Mr. J. William McDonald
Colorado Water Conservation Board

# STATEMENT OF GARY D. COTTON
VICE PRESIDENT - ENGINEERING
SAN DIEGO GAS AND ELECTRIC COMPANY

Submitted for the Record

The U.S. Senate Energy and Natural Resources Committee

Subcommittee on Water and Power

June 22, 1982

## STATEMENT OF GARY D. COTTON
VICE PRESIDENT - ENGINEERING
SAN DIEGO GAS AND ELECTRIC COMPANY

This statement is in support of enactment of S. 2202, a bill to amend the Colorado River Basin Salinity Control Act (PL 93-320) that authorizes certain additional measures to assure accomplishment of the objectives of Title II of such Act, and for other purposes. Our support for S. 2202 derives from two concerns: first, the need to protect the quality of water of the Colorado River which is used in the San Diego area and second, our strong interest in the provisions of the bill that would allow the Secretary of the Interior to enter into joint ventures with industry for beneficial use of saline water.

You have previously heard testimony from Mr. David Kennedy, Assistant General Manager, Metropolitan Water District (MWD) of Southern California and Mr. Myron Holbert, Chief Engineer, Colorado River Board of California. We endorse their testimony and encourage Congress to enact the proposed amendment in order to protect the quality of Colorado River water. Presently, some 10 million people, including the San Diego area, receive water through the MWD system.

San Diego Gas and Electric particularly supports the proposed authorization for the Secretary of the Interior to enter joint ventures with non-federal interests to beneficially use saline water. This company was one of the first to propose using saline water for powerplant cooling. In the mid-1970's San Diego Gas and Electric (SDG&E) proposed development of the Sundesert Powerplant, to be located near Blythe, California, which would use high salinity irrigation return flows from the Palo Verde Irrigation District as a cooling water source. A significant amount of on-site testing demonstrated the technical potential for using saline water for cooling. Although development of a powerplant at the Sundesert site has been temporarily deferred, SDG&E has a long-term need to develop new generating capacity to replace aging plants and to lessen the use of petroleum based fuels.

We are currently evaluating the potential of the Sundesert site as a coal-based power generation site. In recent discussions with representatives of the Bureau of Reclamation and W. R. Grace Co. we have been intrigued by the potential of the Aquatrain proposal for coal-capsule transport using saline water. SDG&E has expressed a willingness to participate in the Aquatrain studies insofar as they may provide a cost competitive method for delivering coal along with additional saline cooling water to the Sundesert site. Although it is too early to speak definitively, the concept appears to have major economic and environmental benefits from a utility, regional, and national perspective. In addition to these benefits of saline water use, using saline water for powerplant cooling frees up fresh water supplies for other uses, thus stretching existing supplies in a water short region.

With regard to the specific language of S. 2202, we would like to commend the sponsors for the broad discretion provided the Secretary of the Interior. Without such discretion, beneficial use of saline water will be greatly curtailed. SDG&E and other southwestern utilities worked with the Bureau of Reclamation during studies leading to publication of the Special Report, Saline Water Use and Disposal Opportunities, dated September, 1981. Significant utility concerns using saline water for energy development which were addressed in that report included financing,timeliness of federal actions, and the need to demonstrate newly developed saline water use technologies.

With regard to the latter, the Special Report suggests that newly developed saline water cooling towers that can recycle water to a total dissolved solids concentration in excess of 100,000 mg/l be evaluated on site. The utilities also feel such towers offer significant promise. However, a long-term demonstration of the maintainability and reliability of such equipment is necessary before the utilities can adopt them for general use. The proposed amendments would give the Secretary the authority to participate in such technology demonstration activities and the utilities strongly support that authority.

In a related area, both Reclamation and the utilities recognize that equipment to use saline water will be more expensive to install and operate than conventional equipment. Many utilities and their public utility commissions feel such additional costs should not be included in the rate base. The proposed amendments give the Secretary the authority, where cost-effective, to assume those additional costs as a part of the salinity control program. Such cost sharing authority for the Secretary is needed if basin-wide saline water use is to become a reality.

Probably the most important aspect of the bill from a utility perspective relates to the timeliness of federal actions. The bill proposes conditional authorization for the Secretary to enter joint ventures for saline water use, with such authorization conditioned on appropriate oversight by the Administration and the Congress. People in the western states have worked with Reclamation in its traditional process of planning and designing projects which classically take an average of about 15 years. Such time frames are not acceptable from a utility viewpoint. Industry generally works in a much shorter planning/design time frame,and it appears that the conditional authorization or "fast track" approach recommended in S. 2202 will allow

Reclamation to work in concert with industry. Without such fast track authority, many of the possible saline water use opportunities will be lost as cost-effective control strategies.

In conclusion, the San Diego Gas and Electric Company supports early enactment of S. 2202 and recommends that the provisions relating to beneficial use of saline water be retained in essentially their present form.

○